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Hydromechanics Department Report

T-Craft Seabase Ramp Loads Model Test Data Report

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14. ABSTRACT

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Seabase, Seakeeping, LMSR, T-Craft, Ramp Loads

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CONTENTS

CONTENTS (continued)

FIGURES

FIGURES (continued)

FIGURES (continued)

TABLES

ABSTRACT

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ADMINISTRATIVE INFORMATION

This work was performed by the Seakeeping Division (Code 5500) of the Hydromechanics Department at the Naval Surface Warfare Center, Carderock Division (NSWCCD). Funding for this model test was provided by the Office of Naval Research (ONR) Code 333 through work request number N0001408WX21204. The work was performed under NSWCCD Work Unit Number 10-1-5500-713 and Job Order Numbers 10-1-5500-731-10 and 10-1-2202-101-50.

INTRODUCTION

The Office of Naval Research (ONR) sponsored a multiple bodied seakeeping model test designed to investigate vessel motions and loads on the hinge points of a cargo transfer ramp connecting a proposed transformable high-speed sealift craft - known as a T-Craft – to a large medium speed roll-on roll-off (LMSR) ship. The vessels are intended to operate in close proximity to each other as an off shore seabase facility. As proposed, the T-Craft is expected to operate as a surface effect ship (SES) while transiting at sea and as part of the offshore seabase, and then transform into an air cushion vehicle (ACV) before arriving at the beach for off-loading. The model test was

designed to augment the results of a previous test [1][1] that measured the motions of the ship/seabase facility while the T-Craft operated in the SES mode connected to (or near) the LMSR and in turn, to another large vessel (known as the MLP) for several operating conditions, seabase configurations, and wave environments. The same government designed T-Craft model was used in both experiments. The government T-Craft hull geometry was derived from averaging the designs of three industry teams. The LMSR model used in the test represented the TAK-296 (USNS GORDON).

TEST CONDITION MATRIX

The test matrix was composed of a varicty of seabase configurations, seaways, operating conditions and T-Craft loading conditions. This matrix included three configurations of the T-Craft and LMSR models that may compose the seabase. Table 1 shows a summary of conditions tested. Appendix A presents a list of all test conditions and the run numbers achieved during cxecution of the test. Appendix B presents a log of all test runs executed. In addition to thc matrix test runs, the Appendix B log includes setup runs, roll decay, pitch decay, surge decay, calm water, and zero runs.

The test was conducted between February and April 2010 in the Maneuvering and Seakeeping (MASK) facility of NSWCCD. The test matrix specified wave environment, relative wave heading, ship speed, physical configuration, and T-Craft loading conditions to be investigated. The numbers 0 and 4 in each of the boxes in Table 1 represent the two ship spceds executed during the test. The T-Craft and LMSR vessels were tested in regular waves for the Tandem (barge and full cushion) conditions only. The regular wave runs were executed with constant wave slope of 1:120 wave height-to-length ratio for frequencies ranging from 0.5 to 1.4 radians per sccond (full-scale). Random wave conditions were chosen to represent three unique Sea State 3 and three Sea State 4 wave environments. Two of the Sea State 3 waves were charactcrized as Bretschneider spectra; one with nominal significant wave height of 2.88 feet and a modal period of 7.5 seconds and the other having a 4.1 foot significant wave height and 10 second modal period (full scale). The third Sea State 3 wave condition was an Ochi-Hubble bi-modal spectrum with a 4.1 foot significant wave height and modal period peaks at 15 and 7.5 seconds (full

[1] References are on page 143.

scale). All three Sea State 4 wave environments were Bretschneider spectra with two having nominal significant wave heights of 6.2 feet and 8.2 feet - each having a modal wave period of 8.8 seconds. The third spectrum had a nominal significant wave height of 8.2 feet with an 11.3-second modal period. The two Sea State 4 spectra with 8.2 feet significant wave heights are listed in Table 1 as "High Sea State 4".

As illustrated in Appendix C, the seabase was tested in configurations that included 1) Tandem - with the models connected bow to stern with a stern ramp, 2) Hinged - with the T-Craft connected directly to the transom of the LMSR, and 3) Side-by-Side - with the T-Craft connected by a sideport ramp on the lee side of the LMSR. As shown in the test matrix of Table 1, the T-Craft model was tested in three different modes in the Tandem. These modes included 1) as a barge (with a Styrofoam block placed between the hulls), 2) as a catamaran, and 3) as a SES with an air cushion between the hulls inflated at both half and full cushions. The Hinged configuration and the Side-by-Side configuration were only run at the full cushion SES operating condition.

For all three configurations, the T-Craft and LMSR hulls were tested at different speed and heading combinations as well as at different loading conditions. The speed and heading conditions included zero and four knots and relative wave headings of head seas (180°), bow seas (200°), and bow quartering seas (210°). There were four different load conditions tested for each seabase configuration. These included a no load condition (similar to the load condition of the 2008 tests [1]), a load representing the weight of an Abrams M1A2 tank on the center of the ramp between the two models, the equivalent of four Abrams M1A2 tanks on the T-Craft model (with no load on the ramp) and the full load condition with the four tank load on the T-Craft deck as well as one on the ramp. Figures showing the locations of the tanks (in green color) on the T-Craft deck are presented in Appendix C.

Table 1. Test Condition Matrix - Summary Table

Tandem Barge

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg			0				
200 deg			0				0 4
210 deg			0				

Tandem Barge (No Ramp)

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg			0				
200 deg			0				
210 deg			0				

Tandem off Cushion

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg			0 4				
200 deg			0 4				
210 deg			0 4				

Tandem Full Cushion

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4	0 4	0 4	0 4	
200 deg	0 4	0 4	0 4	0 4	0 4	0 4	0 4
210 deg	0 4	0 4	0 4			0 4	

Tandem Half Cushion

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4			0 4	
200 deg	0 4	0 4	0 4			0 4	
210 deg	0 4	0 4	0 4			0 4	

Side by Side Full Cushion

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Hinged Full Cushion

No Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Tandem Full Cushion

Ramp Tank Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4	0 4	0 4	0 4	
200 deg	0 4	0 4	0 4	0 4	0 4	0 4	
210 deg	0 4	0 4	0 4	0 4		0 4	

Tandem Half Cushion

Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4			0 4	
200 deg	0 4	0 4	0 4			0 4	
210 deg	0 4	0 4	0 4			0 4	

Side by Side Full Cushion

Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Hinged Full Cushion

Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Tandem Full Cushion

Full Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4	0 4	0 4	0 4	
200 deg	0 4	0 4	0 4	0 4	0 4	0 4	
210 deg	0 4	0 4	0 4	0 4		0 4	

Tandem Half Cushion

Full Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4			0 4	
200 deg	0 4	0 4	0 4			0 4	
210 deg	0 4	0 4	0 4	0		0 4	

Side by Side Full Cushion

Full Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Hinged Full Cushion

Full Load	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Tandem Full Cushion

Full Load w/ Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4	0 4	0 4	0 4	
200 deg	0 4	0 4	0 4	0 4	0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Tandem Half Cushion

Full Load w/ Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4			0 4	
200 deg	0 4	0 4	0 4			0 4	
210 deg	0 4	0 4	0 4			0 4	

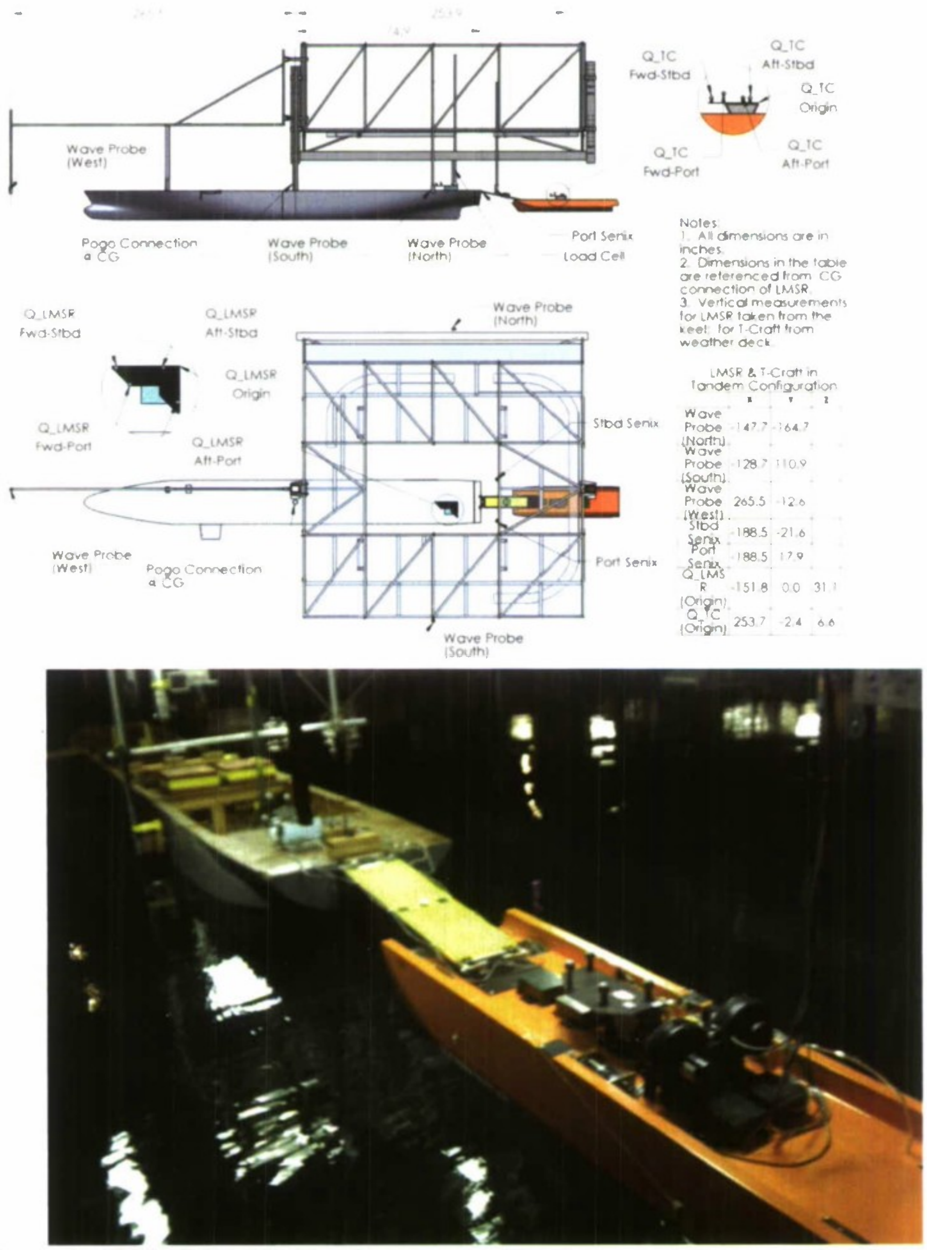
Side by Side Full Cushion

Full Load w/ Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Hinged Full Cushion

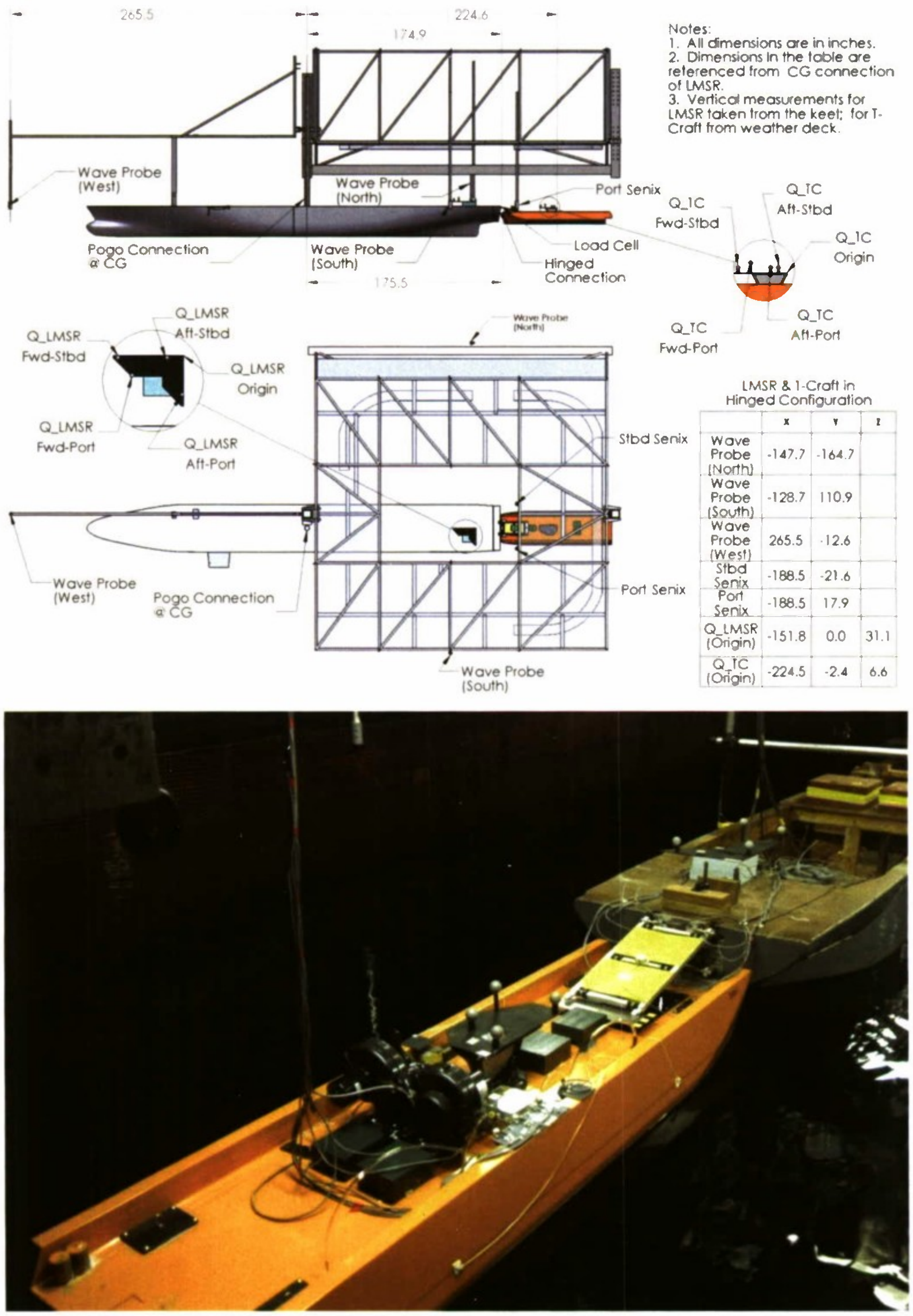
Full Load w Ramp Tank	SS3 7.5sec	SS3 10sec	SS4 8.8sec	Hi SS4 8.8sec	Hi SS4 11.3sec	BiModal SS3	Reg Wave
180 deg	0 4	0 4	0 4		0 4	0 4	
200 deg	0 4	0 4	0 4		0 4	0 4	
210 deg	0 4	0 4	0 4			0 4	

Figure 1 shows the model hulls in the Tandem or bow-to-stern configuration in which the T-Craft was connected to the LMSR hull by an instrumented stern ramp. Three of these tandem ramp connection geometries were tested – two with a fixed ramp foot attached to the T-Craft (as shown in Figure 1) and one with a floating ramp foot in which the T-Craft bow was captured by a hinge connection attached directly to the stern of the LMSR. Figure 2 shows the models in the Hinged configuration and the shortened ramp geometry that was used for the Hinged configuration.



	x	y	z
Wave Probe (North)	-147.7	-164.7	
Wave Probe (South)	-128.7	110.9	
Wave Probe (West)	265.5	-12.6	
Stbd Senix	-188.5	-21.6	
Port Senix	-188.5	17.9	
Q_LMSR (Origin)	-151.8	0.0	31.1
Q_TC (Origin)	253.7	-2.4	6.6

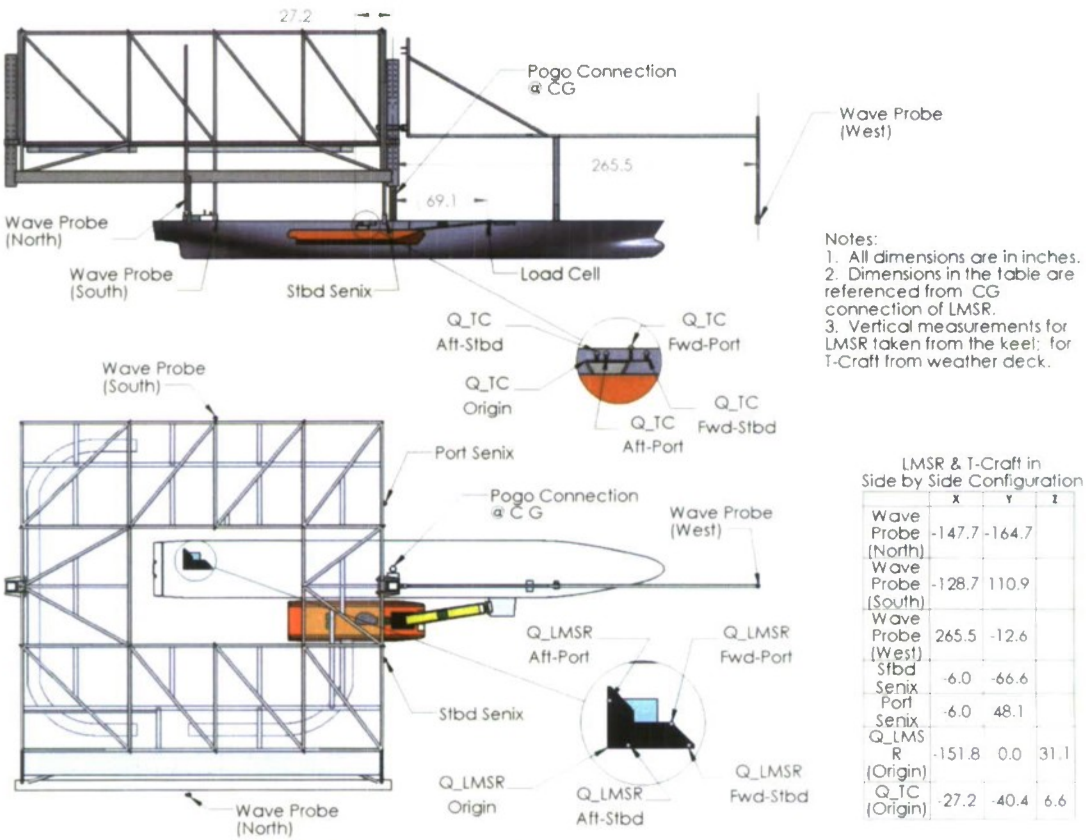
Figure 1. T-Craft/LMSR Tandem test configuration with instrumented stern ramp



LMSR & T-Craft in Hinged Configuration

	x	y	z
Wave Probe (North)	-147.7	-164.7	
Wave Probe (South)	-128.7	110.9	
Wave Probe (West)	265.5	-12.6	
Stbd Senix	-188.5	-21.6	
Port Senix	-188.5	17.9	
Q_LMSR (Origin)	-151.8	0.0	31.1
Q_TC (Origin)	-224.5	-2.4	6.6

Figure 2. T-Craft/LMSR Hinged test configuration with sliding stern ramp



LMSR & T-Craft in Side by Side Configuration

	X	Y	Z
Wave Probe (North)	-147.7	-164.7	
Wave Probe (South)	-128.7	110.9	
Wave Probe (West)	265.5	-12.6	
Stbd Senix	-6.0	-66.6	
Port Senix	-6.0	48.1	
Q_LMSR (Origin)	-151.8	0.0	31.1
Q_TC (Origin)	-27.2	-40.4	6.6

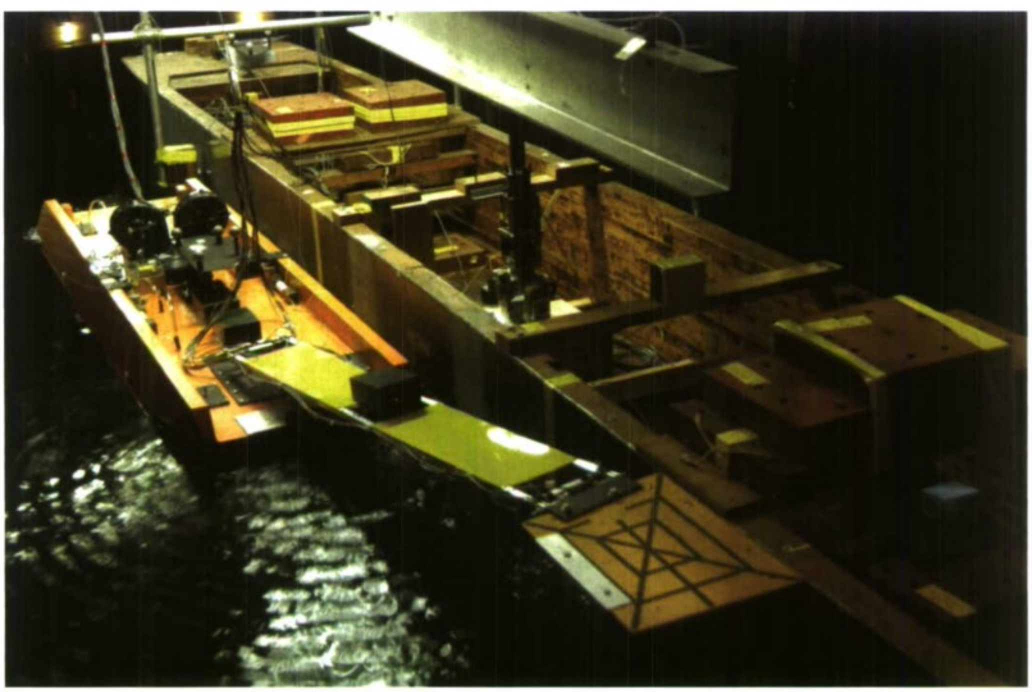


Figure 3. T-Craft/LMSR Side-by-Side test configuration with side port ramp

Figure 3 presents the T-Craft in the Side-by-Side configuration in which the T-Craft, positioned along the lee side of the LMSR, was connected to the LMSR by ramp attached to the LMSR side port platform.

The geometry of each ramp, (except for the ramp used for the Hinged configuration) was based on ramps carried by the LMSR ship. As shown in the figure below, the side port ramp is considerably longer than the stern ramp. A sketch showing model scale geometry of each cargo transfer ramp is presented in Figure 4.

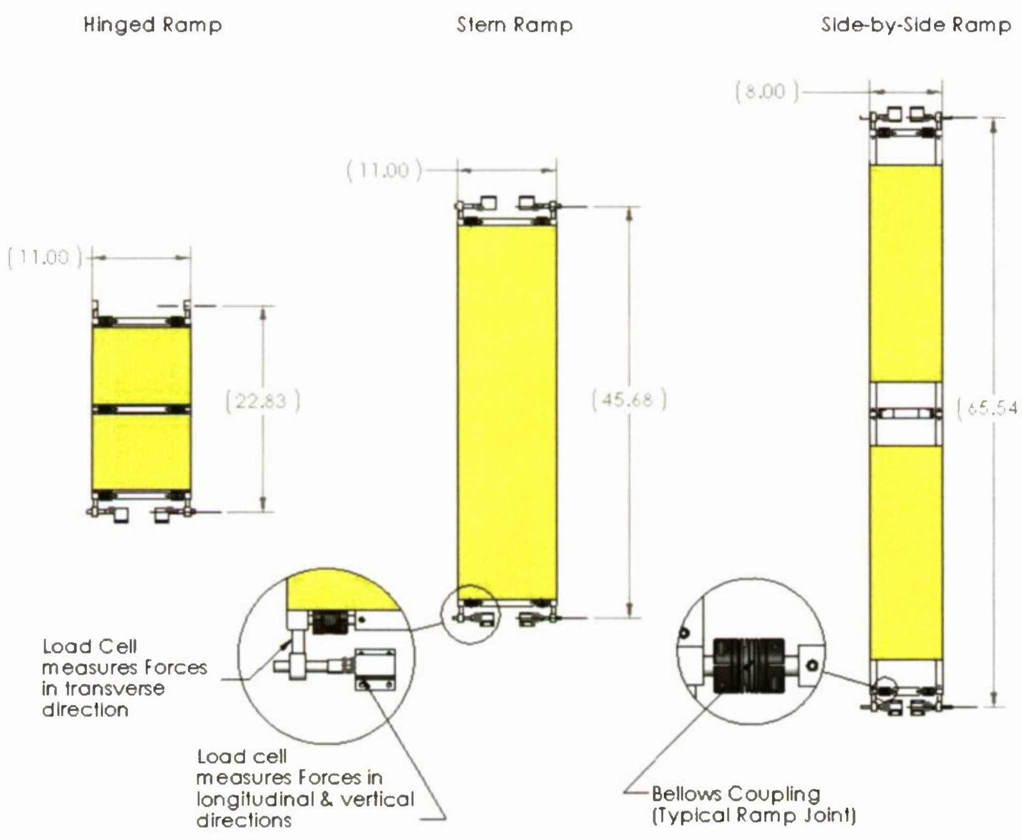


Figure 4. Ramp geometries for the Hinged, Tandem stern ramp, and Side-by-Side ramp test configurations

MODEL DESCRIPTIONS

T-Craft Model

The T-Craft model (DTMB Model Number 5687) was designed by John Hoyt, III, and built by the NSWCCD Model Shop. The rationale driving the design was to formulate a generie Government T-Craft hull form based on assimilating the salient design features from eaeh of three proposed eontraet hull designs. The performanee of the T-Craft would then be evaluated as a part of a seabase with the LMSR roll-on/roll-off hull. Figure 5 shows a photograph of the Government T-Craft hull. As tested, the hull was eharaeterized as a surfaee effeet (SES) hull form with rigid side hulls and inflatable bow and stern skirts. The bow was fitted with finger skirts while the stern was designed with lobe type skirts. A transverse seal skirt divided the air eushion ehamber into two separate eavities under the wet deek. Figure 6 presents a photograph of the underside of the T-Craft hull. Visible are the bow finger skirts (in the foreground), the transverse seal skirt, and the stern lobe skirt (in the baekground). Figure 7 is a elose-up photograph of the transverse seal skirt showing details of the stereo lithography apparatus (SLA) fabrieated framework used to seeure the skirt to the hull. Similar SLA struetures were used to seeure eaeh of the nylon finger skirts to the underside of the wet deek bow.

The T-Craft was tested at three different drafts: 1) off eushion, 2) half eushion (Tandem test configuration only), and 3) full cushion. The waterline of the model off cushion was at the wet deek. The waterline of the T-Craft model on full eushion was 3.63 inehes below the wet deek model seale (2.78 meters full-seale). The ballast eonditions of the T-Craft model are presented in Table 2 and the T-Craft waterlines are depieted in Figures 8, 9, and 10.

Figure 5. T-Craft hull for ramp load test

Figure 6. T-Craft wet deck showing bow finger skirt, transverse seal, and aft lobe skirts

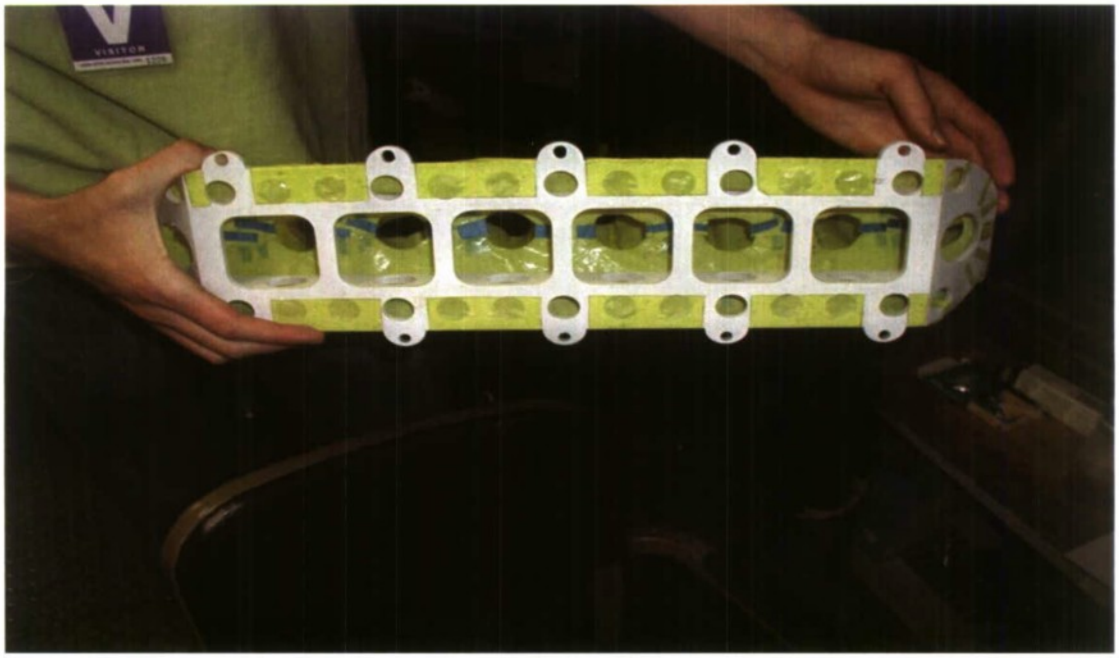


Figure 7. Photograph of the transverse seal skirt showing details of the stereo lithography apparatus (SLA) fabricated framework

Table 2. T-Craft table of particulars

Ballast Conditions - T-Craft Model No. 5687			
Scale Ratio = 30.209			
Parameter	Model Scale as tested	Equivalent Full Scale as tested	
	Inches	feet	meters
Length Overall	99.5	250.48	76.35
Length Waterline off cushion	98	246.71	75.20
Length Waterline on cushion	88	221.53	67.52
Beam Max	29	73.01	22.25
Cushion Width	21.5	54.12	16.50
Cushion Length	87.5	220.27	67.14
Displacement (fresh water model scale lbs; salt water full scale Ltons/tonnes)	120.6	1522.31	1497.96
LCG (forward from wet deck transom)	48.5	122.09	37.21
TCG (starboard of centerline)	0	0.00	0.00
VCG (below deck)	0.29	0.73	0.22

Tandem Configuration

Figure 8. T-Craft drafts Tandem configuration at no load and full load (model scale in.)

Side by Side Configuration

Figure 9. T-Craft drafts Side-by-Side configuration at no load and full load (model scale inches)

Figure 10. T-Craft drafts Hinged configuration at no load and full load (model scale inches)

The T-Craft hull was constructed of two layers of ¾-inch thick aluminum honeycomb sheeting separated by a light density foam board. Channels were cut in the foam board to direct the airflow into the cushion chambers and skirts below the wet deck. The surfaces of the honeycomb sheets were covered with carbon fiber mats to stiffen the lightweight aluminum sheets. Rigid side hull structures, constructed of light density poly foam, were epoxied to the sides of the carbon fiber wet deck structure. The topside of the wet deck was fitted with two squirrel cage fans, four lifting rings, four pressure gages, several motion sensors, and a ramp foot assembly. A plan view drawing of top, center, and lower plates of the T-Craft is presented in Figure 11. This figure details the airflow holes for each of the separate plates that make up the transverse deck.

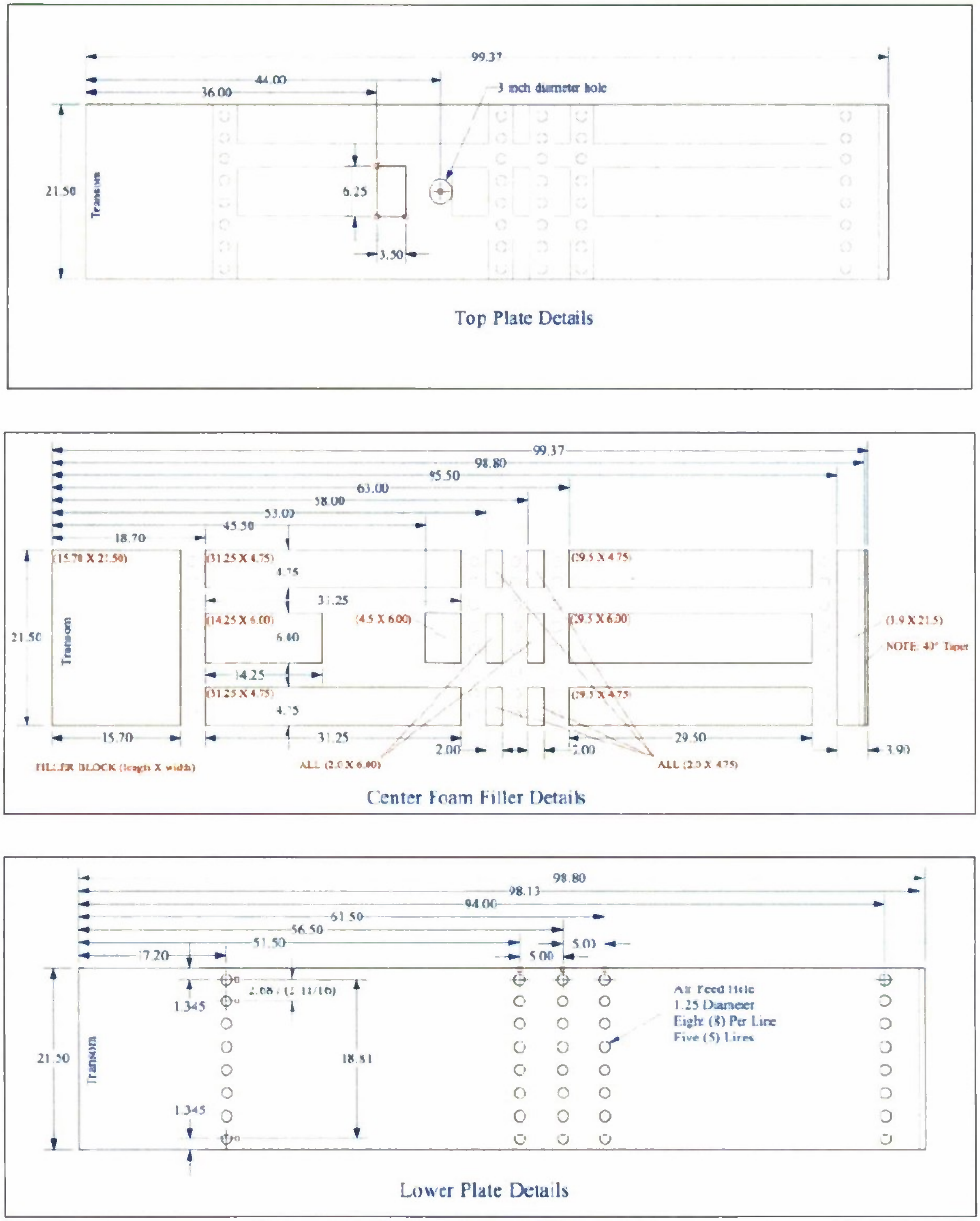


Figure 11. A plan view of T-Craft deck composition

LMSR Model

As previously stated, the LMSR was represented by DTMB Model Number 5494, which is a 30.209 scale hull model of the USNS GORDON (T-AKR296). This model was fabricated out of wood and was fitted with a stern ramp for use with the Tandem test set-up and a side port platform/ramp for use with the T-Craft in the Side-by-Side configurations. The LMSR hull was appended with stern blisters, an inactive centerline rudder, port and starboard shaft tubes and struts, and bilge keels. The bilge keels were attached to the hull starting at Station 8.74 and terminating at Station 13.27. Their span was equivalent to 0.38 meters and they were fixed at the turn of the bilge port and starboard. The draft of the LMSR as tested was 10.652 meters (35 feet). Table 3 shows detailed ballast conditions for the LMSR. A sketch of the LMSR body plan (showing an outline of the stern blisters) and principle rudder dimensions are presented in Figures 12 and 13, respectively.

Table 3. LMSR Table of Particulars

Ballast Conditions – LMSR Hull Model No. 5494				
Scale Ratio = 30.209 CAV 1 Departure Load Condition				
Parameter	Full Scale Desired	Model Scale as tested	Equivalent Full Scale As Tested	
	Feet	inches	Feet	meters
Length	894.5	355.3	894.4	272.6
Beam	105.8	42.00	105.7	32.2
Displacement (fresh water model scale lbs; salt water full scale Ltons/tonnes)	55459.6	4396.8	55500.6	56391.1
LCG (aft of FP)	479	189	474.2	144.5
TCG (starboard of centerline)	0	0	0	0
VCG (up from BL)	45.3	18.2	45.5	13.9
GM (from MSC)	5.4	2.1	5.4	1.6
Pitch gyradius	223.6	83.9	211.3	64.4
Roll gyradius	39.2	15.3	38.4	11.7
Yaw gyradius	223.63	86.3	217.2	66.2
Roll Period		3.44 sec	18.9 sec	18.9 sec

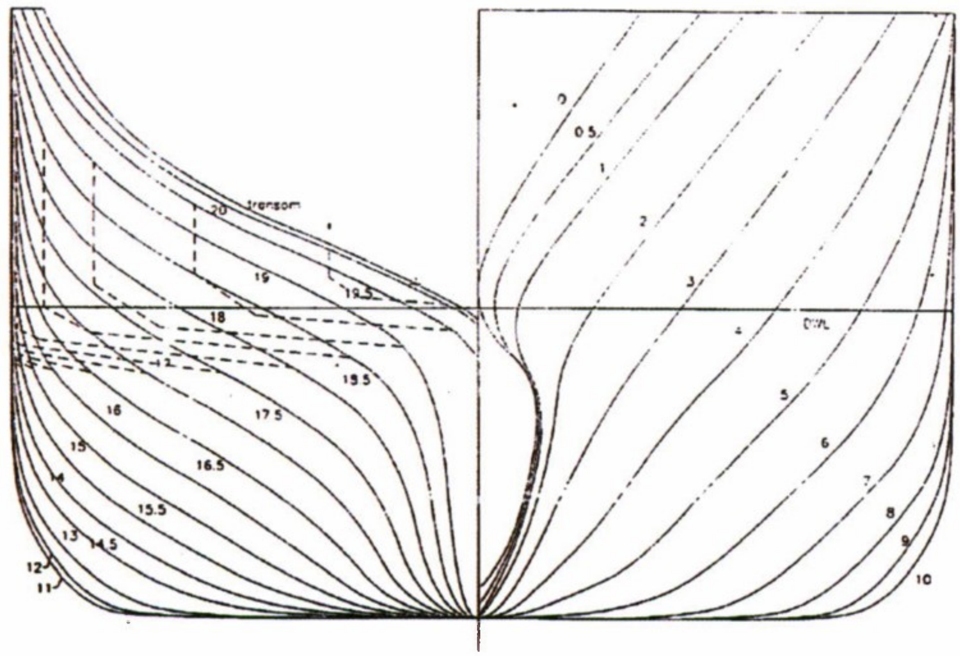


Figure 12. LMSR body plan showing stern blisters (as dashed lines)

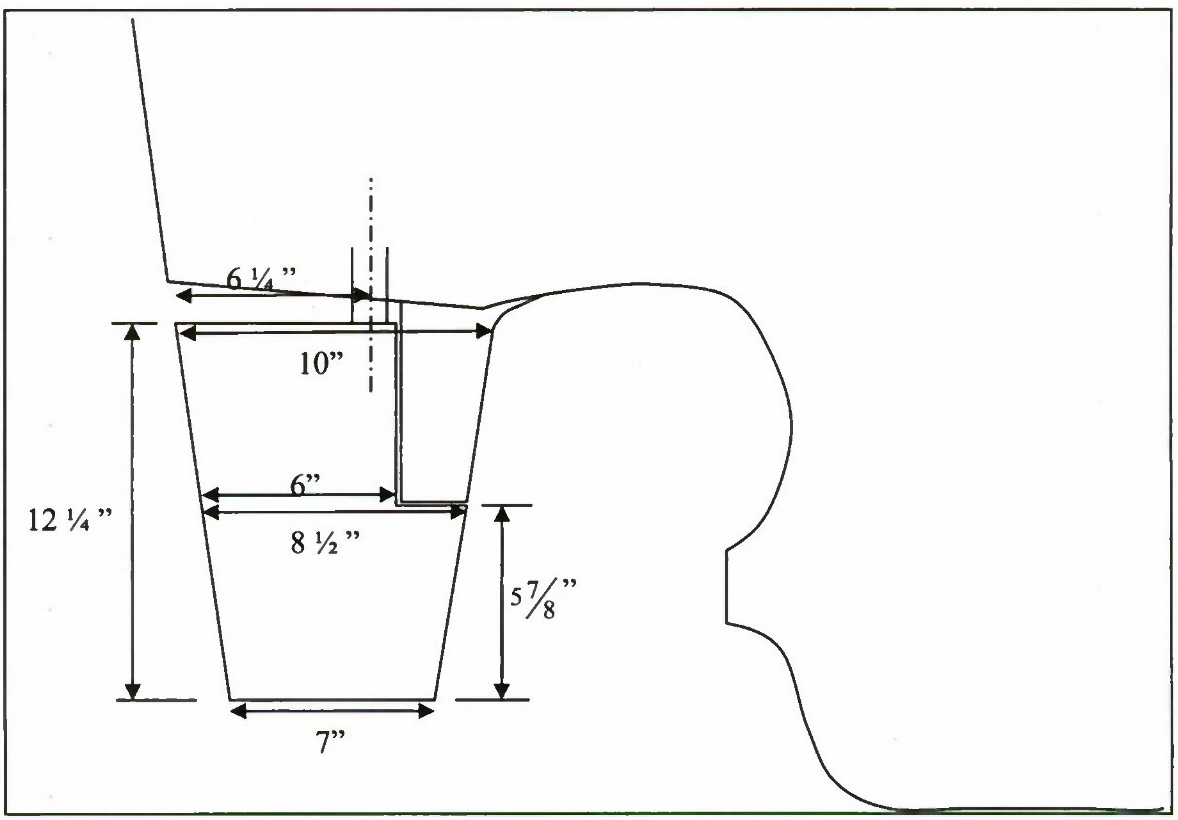


Figure 13. LMSR rudder sketch

Ramp Models

The ramps were fabricated by assembling four longitudinal links (3/4"x3/4" aluminum tube), three transverse links, six Bellows couplings, four pedestal load cells (F_x, F_z) and four transverse load cells (F_y). Each transverse link was connected to a longitudinal link via a Bellows coupling, thus creating a flexible joint. The end of each longitudinal link included a transverse load cell that connected to a pedestal load cell (see detailed diagram in Figure 14).

Three ramps were tested, each with different overall dimensions (measured from load cell connection points); with the Tandem ramp weighing 5.72 lbs, the Side-by-Side weighing 6.35 lbs, and the ramp used for the Hinged configuration weighing 3.19 lbs. Pedestal load cells consisted of a pair of strain gages with matching pair on opposite faces. Two pair combinations were wired into three separate strain gage bridges providing three force measurements (X, Y, and Z). The strain gages are visible in the diagram of the pedestal load cell shown in Figure 14.

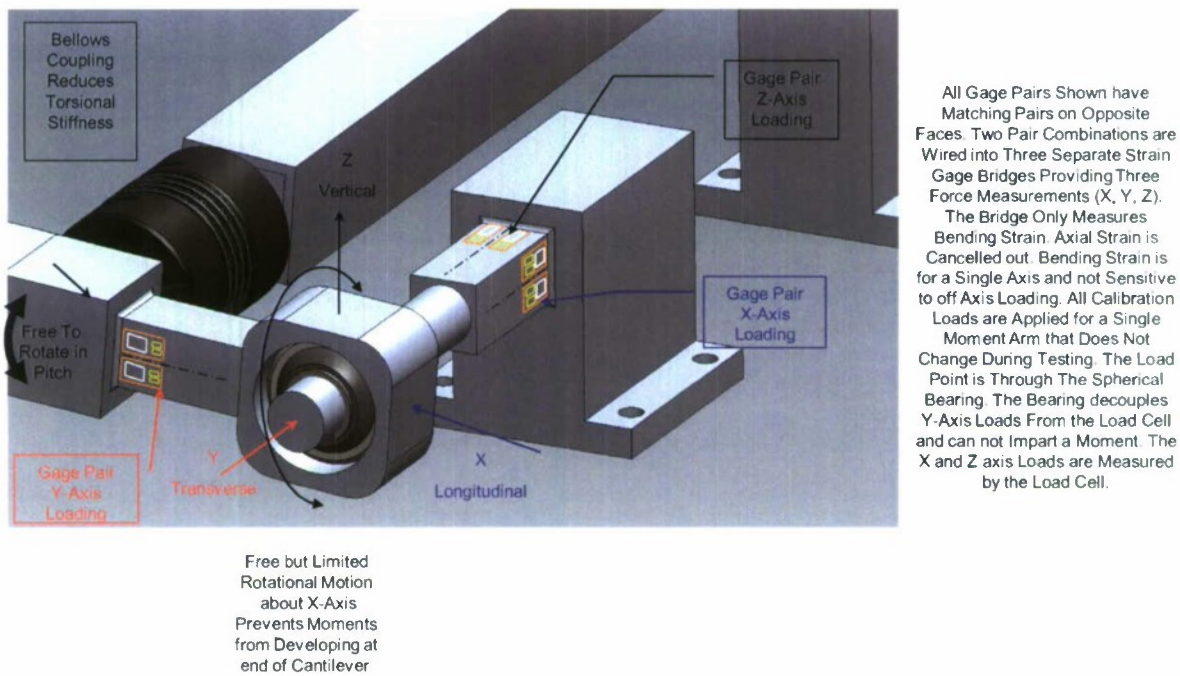


Figure 14. Details of the ramp pedestal load cell connection

MODEL TEST SETUP

The LMSR hull was connected to the MASK Carriage by a concentric vertical shaft device known as a 'pogo stick'. The concentric shafts permitted the model freedom to heave. A pitch/roll gimbal installed at the base of the pogo (installed at the models' longitudinal and vertical centers of gravity (LCG and VCG)) permitted the LMSR model freedom to pitch and roll as well. The LMSR attachment point to the carriage thus restricted motions in surge, sway, and yaw. A photograph of the pogo stick assembly as installed on the LMSR model is presented in Figure 15. Visible, from the top down, are the heave potentiometer, pogo stick, two block gages (to measure LMSR surge and sway forces), and at the base of the pogo, the LMSR pitch/roll gimbal.

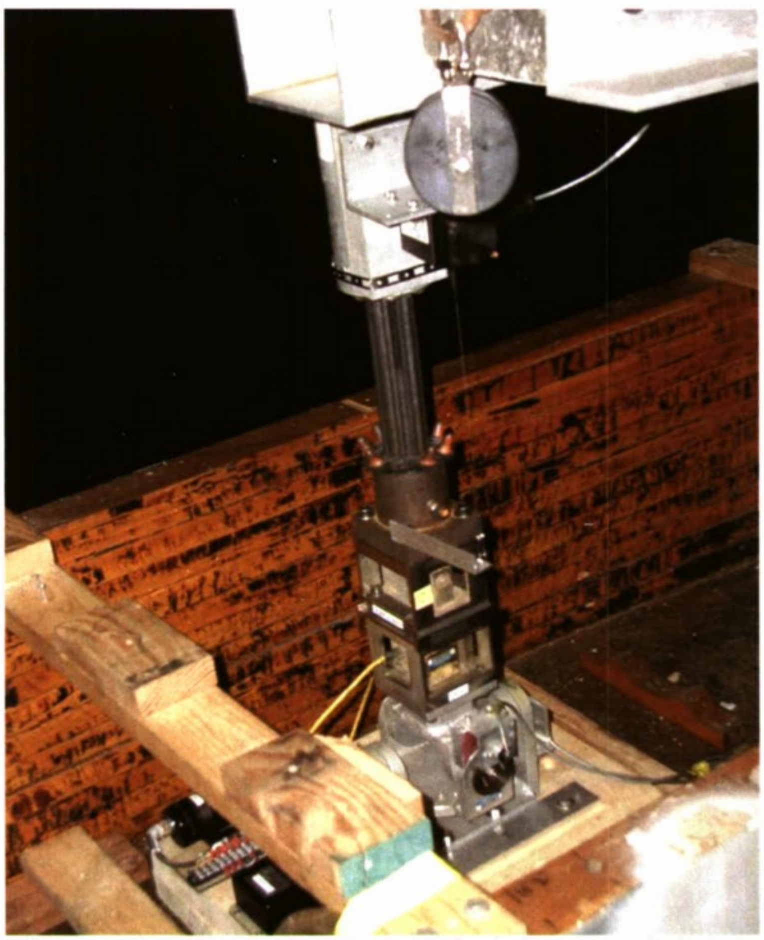


Figure 15. Photograph of the LMSR 'Pogo', Block Gages, and Pitch /Roll Gimbal

Side-by-Side Hull Configuration

The T-Craft model was stationed (from its LCG) 27.2 inches aft of the LMSR (LCG). Both models were in a parallel position with a distance of 2.1 inches between outer hulls. The Test Matrix specified that the T-Craft model be tested on the starboard (leeward) side of the LMSR.

The T-Craft was attached to the starboard side port platform of the LMSR model via a ramp, as shown in Figure 16. Pedestal load cells at the ramp head and ramp foot were used to attach the ramp to each vessel.

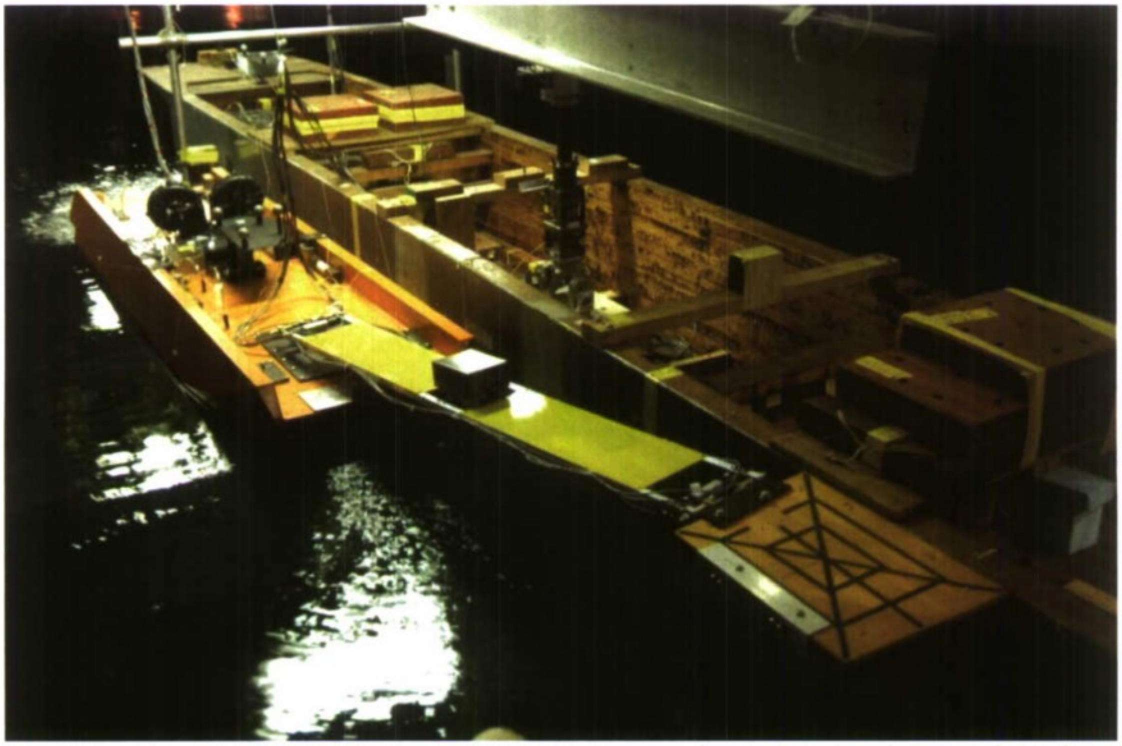


Figure 16. Photograph of the Side-by-Side test configuration showing a tank load on the mid span of the LMSR side port ramp

Tandem Configuration

The Tandem test configuration was accomplished by connecting the bow of the T-Craft to the stern of the LMSR with a ramp. The ramp forward end was pinned to the LMSR stern with pedestal load cells at the main deck level. The ramp was free to pitch at this location. The aft end of the ramp was attached to the T-Craft weather deck via pedestal load cells also free to pitch. Figure 17 shows a photograph of the Tandem ramp assembly as installed near the bow of the T-Craft hull.

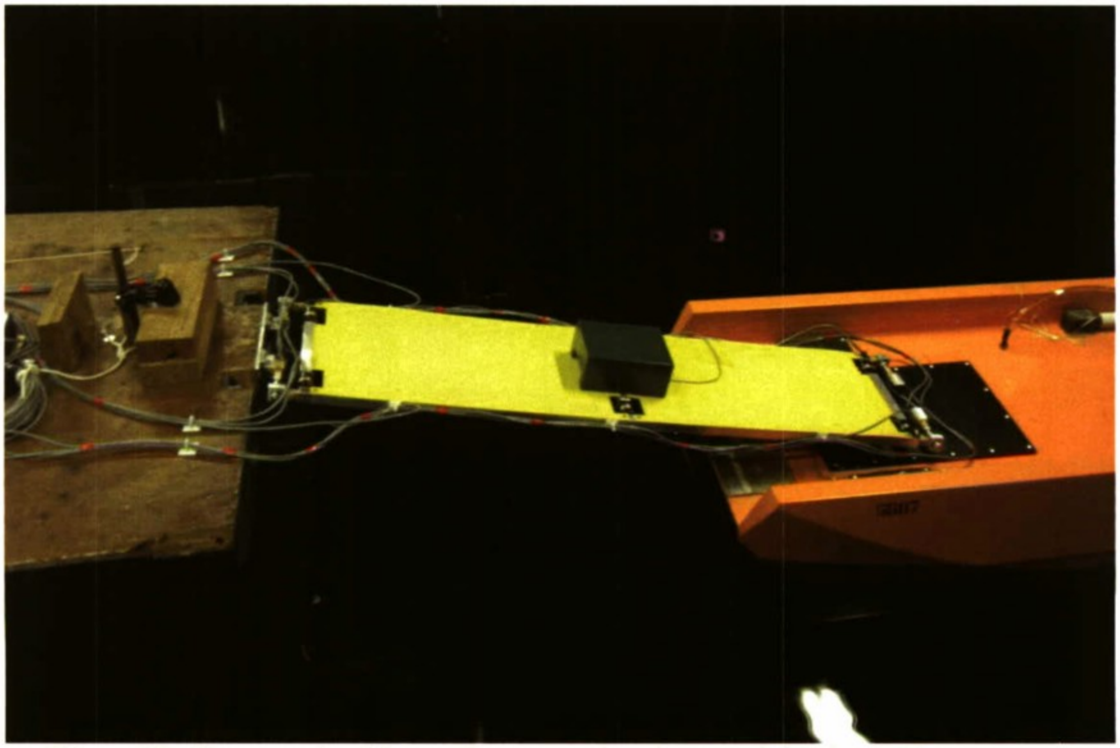


Figure 17. Photograph of the tandem ramp showing a tank load at mid span

Hinged Ramp Configuration

Multiple attachment points were used in the hinge configuration. First, the T-Craft bow was attached to the transom of the LMSR via pedestal load cells, creating a space of 1.88 inches (model scale) between the two vessels. The Pedestal load cells created a hinge connection allowing the T-Craft to pitch independently. Second, the forward end of the ramp was pinned to the LMSR stern with pedestal load cells at the main deck level. The ramp was free to pitch at

this location. As shown in Figure 18, the aft end of the ramp was free to move (without any restraints) on the surface of a flat plate that was mounted above the T-Craft weather deck. A miniature 6-axis load cell sensor (Nano 25), mounted between the flat plate and the T-Craft weather deck, recorded the inertial load of the ramp moving on the flat plate.

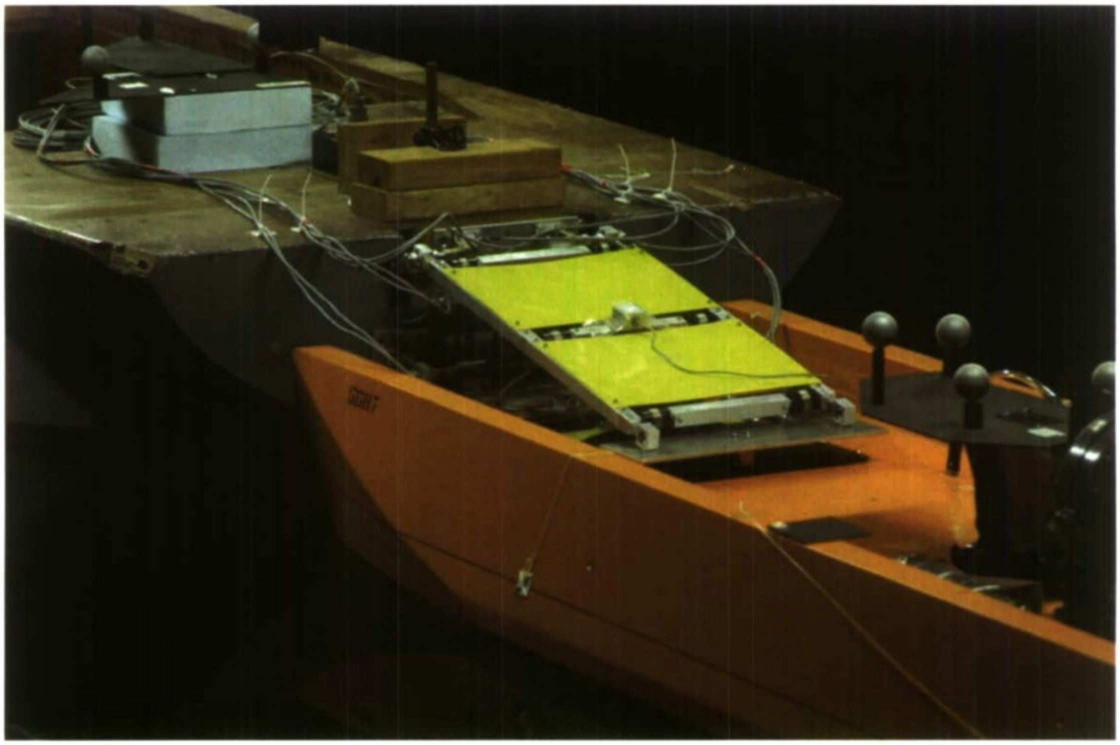


Figure 18. Photograph of the Hinged ramp test setup showing the Nano load cell positioned below the ramp foot

RAMP CALIBRATION

The T–Craft test consisted of three different ramps with varying lengths. The ramp configurations included Tandem, Side-by-Side and Hinged (half the length of the ramp for Tandem configuration due to limited spacing on the T-Craft deck). Figure 4 shows each ramp dimension in model scale. Bellows couplings were attached to each transverse joint of the ramp to reduce ramp torsional stiffness.

Four pedestal load cells at the ends of each ramp measured forces in longitudinal, transverse and vertical directions (see Figure 14).

Calibration of each pedestal load cell consisted of measuring strain gage outputs while suspending weights ranging from 0 lbs. to 50 lbs. from a test fixture in longitudinal, transverse and vertical directions (see Figure 19 below).

Figure 19. Photograph showing pedestal load cell calibration setup

Once the entire ramp was assembled, it went through several calibration tests to simulate typical ramp loading in yaw, surge and sway. Weight plates up to 10 lbs were placed at the center of the ramp to simulate various vehicle loads and verify output of loads at each gage. Forces in all three directions were collected to understand cross coupling of the dominant forces with respect to each motion. The ramp was restrained at one end by its pedestal load cells to simulate attachments to the LMSR stern. At the T-Craft end, the ramp foot was unrestrained. A cable and pulley system attached to the deck plate and weights suspended at the other end simulated surge load. Incremental weights were added and forces in three directions were collected. A similar method was used to record the forces in the transverse direction, by simulating a sway load at the deck plate. When simulating sway load, longitudinal forces at the restrained side were not equal and opposite of the unrestrained side. The longitudinal forces at the restrained side were much greater than unrestrained side (T-Craft).

To simulate yaw load, a pulley system was attached at the ramp foot deck plate that created a horizontally applied force equal and opposite in direction (see Figure 20). Ramp gage responses in three directions were recorded to confirm that cross coupling was minimal and that the resultant forces at each attachment point were equal and opposite.

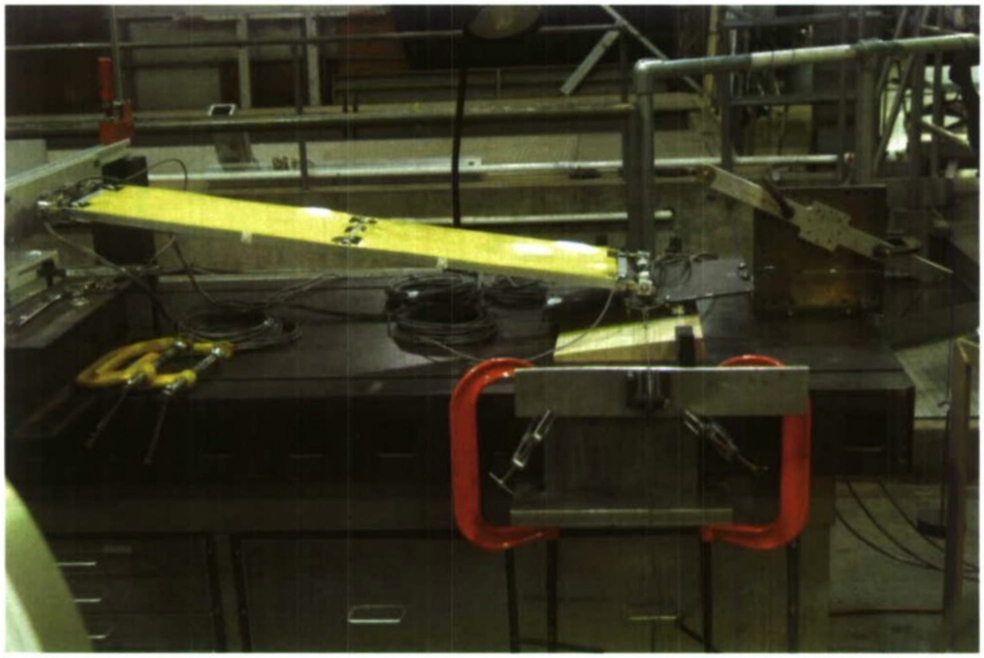


Figure 20. Photograph of the yaw force calibration setup

To measure torsional stiffness of each ramp, a similar weight and pulley system was used. One end of the ramp was fixed while the other end was free to twist. A range of weights (0 – 2 lbs) in 0.5 lb increments were placed on the port and starboard sides of the ramp to introduce a twisting motion while load cell base plate was balanced midway on a sharp edge. Equal weights were placed on opposite corners of the ramp, see Figure 21. At each corner of the ramp, the angle of twist and the weight were recorded and used to calculate the amount of moment generated by angle of deflection (see Figures 22a and b). The results were not linear and displayed a hysteresis loop due to inconsistencies in the range of motion of the Bellows couplings.

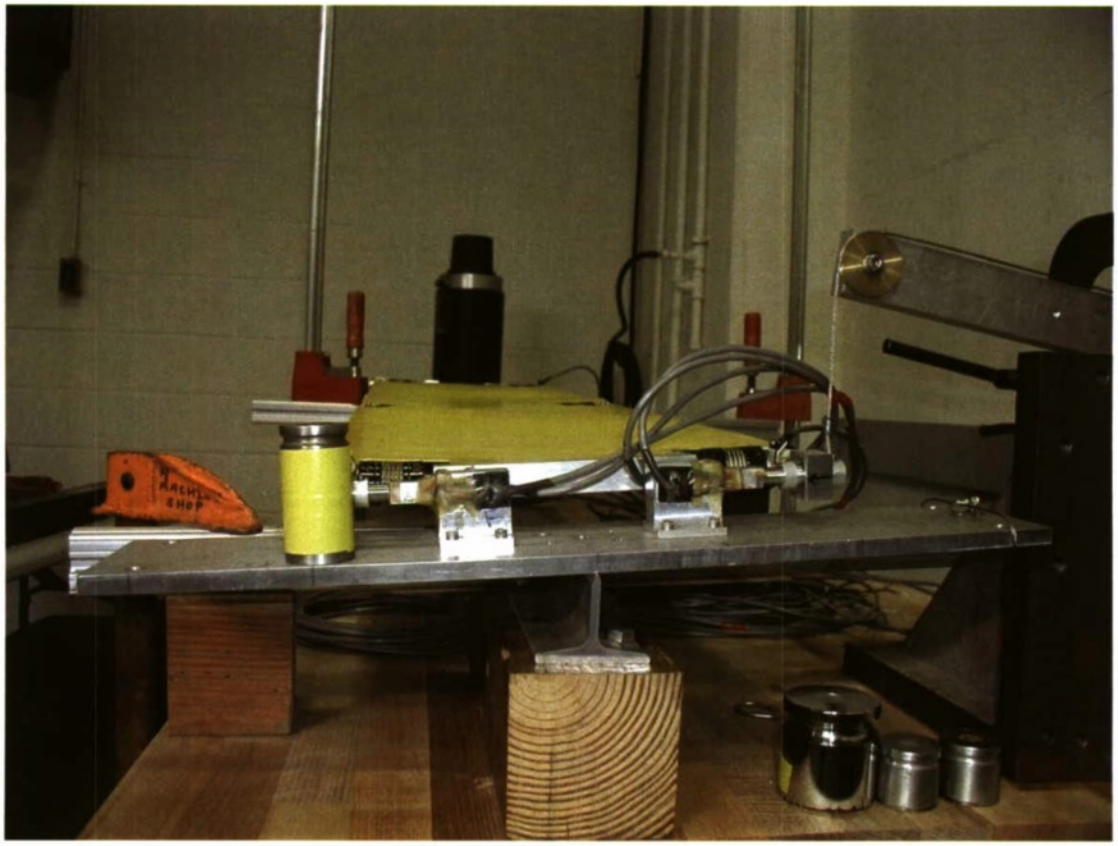
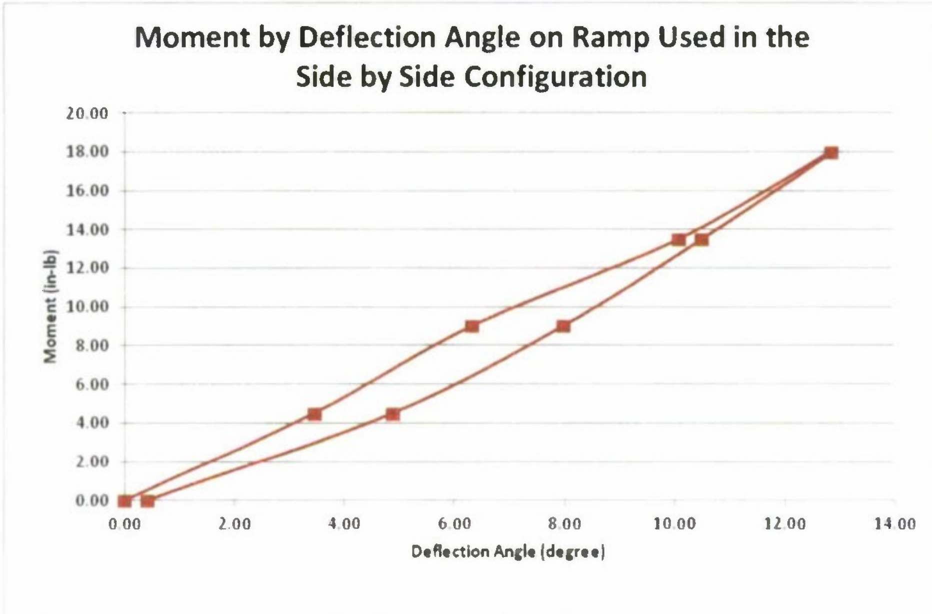
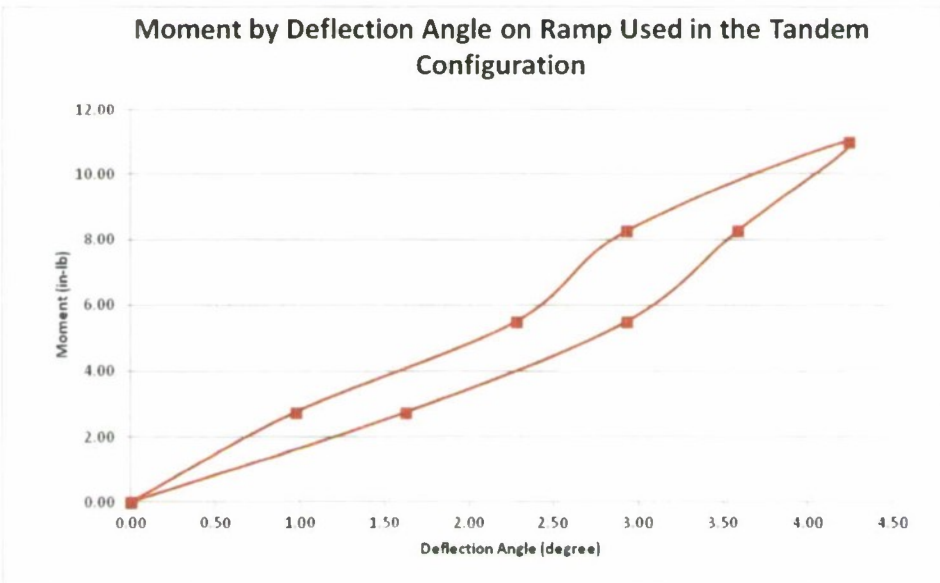


Figure 21. Ramp torsional stiffness test setup aft end looking forward



a.



b.

Figure 22. Results of Defleetion Angle Measurements for T-Craft ramps used in the a. Side-by-Side and b. Tandem Configurations

Instrumentation

During these experiments, 66 ehannels of data were colleeted through the Hottinger Baldwin Messtechnik (HBM) data aequisition system. As the data were being eolleeted, they were filtered by a Butterworth filter at 20 Hz that was part of the HBM data aequisition system.

These channels included motion sensors for the model, strain gages at key ramp locations, carriage speed, and wave probes. An additional computer and a National Instrument data acquisition package was used to take the data from a 6-axis force sensor called a Nano. The Nano sensor was used for the Hinged configuration and was included in the test to help determine ramp loads at the foot of the ramp.

A summary of the instrumentations used with the T-Craft and LMSR models appears in Tables 4 and 5 respectively. The remaining instrumentation appears in Tables 6-8. Tables 6-8 are made up of the instrumentation that was either mounted on the carriage or on the ramp (Tandem, Side-by-Side and Hinged).

Table 4. T-Craft instrumentation list

Chennel Name	Ch #	Manufacturer	Type Transducer	Model	Serial Number	BarCode	Long. Location	Trans. Location	Vertical Location	Polerity
Roll T-Craft	26	Rosemount Aerospace	Vertical Gyroscope	VG-34-0803-3	20111	039360	47.5 FWD	8.38 PQRT	1.44 ABV	+ port side up
Pitch T-Craft	27									+ bow down
Roll Rate	28	Systron Donner	Gyrochip II Rate Sensor	ORS14-00100-103	45953	NA	46.13 FWD	6.13 STBD	1.75 ABV	+ port side up
Pitch Rate	29			QRS14-00050-103	43438					+ bow down
Yaw Rate	30			ORS14-00050-103	43420					+ bow to port
T Bow Accel	31	Crossbow	Tri-Axial Linear Accelerometer	CXL02LF3	17176	039557	72.88 FWD	ON C_L	0.44 ABV	+ accel port
V Bow Accel	32									+ accel up
L CG Accel	33	Crossbow	Tri-Axial Linear Accelerometer	CXL02LF3	9914972	039296	AT LCG	ON C_L	0.44 ABV	+ accel fwd
T CG Accel	34									+ eccel port
V CG Accel	35									+ accel up
Fwd Cush Press	39	Omega	Pressure Gage	PX163-2.5BD5V	151	NA	46.88 FWD	10.13 STBD	3.00 ABV	- vacuum
Trans Seat	40				056	NA	43.69 FWD			- vacuum
Aft Cush Press	41				055	NA	52.75 FWD			- vacuum
Stern Lobe Press	42				038	NA	40.38 FWD			- vacuum
Q Roll	43	Qualisys	Infared Optical Tracking System	ProRflex MCUI120	NA	NA	49 FWD	2.38 STBD	6.63 ABV	+ port side up
O Pitch	44									+ bow down
O Yaw	45									+ bow to port
Q Surge	46									+ fwd
O Sway	47									+ to port
Q Heave	48									+ up
Fan RPM	49	Encoder Producs Co.	Encoder	Accucoder	1540911	NA	42.13 FWD	4.81 PQRT	6.63 ABV	elways +

Note: Long. Locations are relative to the stem, Trans. Locations are relative to C_L and Vertical Locations are relative to top of the weather deck. (All Dimensions are in Inches)

Motions, accelerations, pressures, and fan speed were measured on the T-Craft model. Roll and pitch were measured using a vertical gyroscope as the primary measurement device. The Qualisys Infrared Optical Tracking System was used to record the 6 degrees-of-freedom T-Craft and LMSR motions. The tracking system was the sole measurement for T-Craft yaw, surge, sway, and heave. Acceleration data was collected from two tri-axial accelerometers mounted on the T-Craft: one at the bow and one at the CG of the model. Pressures were measured at four locations within the T-Craft plenum volume. Occasionally, one of the four pressure measurements would "*go bad*" when water would enter the tubing that connected the pressure tap to the gage. Whenever this problem occurred, the tubing was cleared of any water, and the gages would begin working as expected. By the end of the test period, it became routine

to check the pressure gages for this problem at the start of each shift and any time after the T-Craft came off cushion.

Table 5. LMSR instrumentation list

Channel Name	Ch #	Manufacturer	Type Transducer	Model	Serial Number	BarCode	Long. Location	Trans. Location	Vertical Location	Polarity
Roll LMSR	8	Rosemount Aerospace	Vertical Gyroscope	VG-34-0803-3	20123	039362	164.31 FWD	7.25 PORT	14.00 ABV	+ port side up
Pitch LMSR	9									+ bow down
Heave LMSR	10	Celesco	Stringpot	PT1DC-30	K1305322A	NA	171.50 FWD	5.50 STBD	NA	+ translation up
T Bow Accel	11	Columbia	Tri-Axial Accelerometer	SA307TX	1649	039217	363.25 FWD	ON C_L	27.06 ABV	+ accel port
V Bow Accel	12									+ accel up
L CG Accel	13	Columbia	Tri-Axial Accelerometer	SA307TX	1721	NA	163.75 FWD	ON C_L	13.69 ABV	+ accel fwd
T CG Accel	14									+ accel port
V CG Accel	15									+ accel up
T Stn Accel	16	Columbia	Tri-Axial Accelerometer	SA307TX	1637	039048	17.25 FWD	ON C_L	27.06 ABV	+ accel port
V Stn Accel	17									+ accel up
Drag	18	NSWC	4" Block Gage	NA	NA	021445	173 FWD	ON C_L	23.50 ABV	+ push aft
Side Force	19			NA	NA	021078	173 FWD	ON C_L	27.50 ABV	+ push to port
O Roll	20	Qualisys	Infared Optical Tracking System	ProRflex MCU1120	NA	NA	21.75 FWD	ON C_L	31.12 ABV	+ port side up
O Pitch	21									+ bow down
O Yaw	22									+ bow to port
O Surge	23									+ fwd
O Sway	24									+ to port
O Heave	25									+ up

Note: Long. Locations are relative to the stern, Trans. Locations are relative to C_L and Vertical Locations are relative to the keel. (All Dimensions are in Inches)

Table 6. Ramp (Tandem), carriage channels, and other instrumentation list

Channel Name	Ch #	Manufacturer	Type Transducer	Model	Serial Number	BarCode	Long. Location (tandem)	Trans. Location (tandem)	Vertical Location (tandem)	Polarity
Time	1	NA	NA	NA	NA	NA	-	-	-	always +
Carr Speed	2	NA	Encoder	NA	NA	NA	-	-	-	always +
North Wave Ht	3	Senix Corporation	Senix Ultrasensors	TS-30S	106045	039340	-	-	-	+ up
South Wave Ht	4				106063	039334	-	-	-	+ up
West Wave Ht	5		Senix TSPC Tough Sonic	TS-30S	4120479	NA	-	-	-	+ up
Port Wave Ht	6				4120475	NA	-	-	-	+ up
Stbd Wave Ht_tc	7				4120476	NA	-	-	-	+ up
L Accel Ramp	36	Crossbow	Tri-Axial Linear Accelerometer	CXL02LF3	9914974	039297	105.64	ON C_L	6.90	+ accel fwd
T Accel Ramp	37									+ accel port
V Accel Ramp	38									+ accel up
TCraft Port Fx	50	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	83.37	3.03	1.53	+ TC push fwd
TCraft Port Fy	51			NA	NA	NA	84.64	4.91	1.43	+ TC push port
TCraft Port Fz	52			NA	NA	NA	83.15	3.03	2.40	+ TC push up
TCraft Stbd Fx	53	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	83.37	3.03	1.53	+ TC push fwd
TCraft Stbd Fy	54			NA	NA	NA	84.64	4.91	1.43	+ TC push port
TCraft Stbd Fz	55			NA	NA	NA	83.15	3.03	2.40	+ TC push up
LMSR Port Fx	56	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	128.05	3.03	11.00	+ TC push fwd
LMSR Port Fy	57			NA	NA	NA	126.70	4.91	10.54	+ TC push port
LMSR Port Fz	58			NA	NA	NA	127.81	3.03	10.79	+ TC push up
LMSR Stbd Fx	59	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	128.05	3.03	11.00	+ TC push fwd
LMSR Stbd Fy	60			NA	NA	NA	126.70	4.91	10.54	+ TC push port
LMSR Stbd Fz	61			NA	NA	NA	127.81	3.03	10.79	+ TC push up
Fx Total TCraft	62	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fx Total LMSR	63	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total TCraft	64	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total LMSR	65	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fz Total	66	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA

Note: Long. Locations are relative to the stern, Trans. Locations are relative to C_L and Vertical Locations are relative to top of the weather deck. (All Dimensions are in Inches)

Table 7. Ramp (Side-by-Side), Carriage Channels, and Other Instrumentation List

Channel Name	Ch #	Manufacturer	Type Transducer	Model	Serial Number	BarCode	Long. Location (side-side)	Trans. Location (side-side)	Vertical Location (side-side)	Polarity
Time	1	NA	NA	NA	NA	NA	-	-	-	always +
Carr Speed	2	NA	Encoder	NA	NA	NA	-	-	-	always +
North Wave Ht	3	Senix Corporation	Senix Ultrasensor-S	TS-30S	106045	039340	-	-	-	+ up
South Wave Ht	4				106063	039334	-	-	-	+ up
West Wave Ht	5		Senix TSPC Tough Sonic	TS-30S	4120479	NA	-	-	-	+ up
Port Wave Ht	6				4120475	NA	-	-	-	+ up
Stbd Wave Ht_tc	7				4120476	NA	-	-	-	+ up
L Accel Ramp	36	Crossbow	Tri-Axial Linear Accelerometer	CXL02LF3	9914974	039297	105.64	ON C_L	6.90	+ accel fwd
T Accel Ramp	37									+ accel port
V Accel Ramp	38									+ accel up
TCraft Port Fx	50	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	79.86	1.37	2.28	+ TC push fwd
TCraft Port Fy	51			NA	NA	NA	80.86	2.84	2.12	+ TC push port
TCraft Port Fz	52			NA	NA	NA	79.64	1.37	2.06	+ TC push up
TCraft Stbd Fx	53	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	80.50	2.58	2.28	+ TC push fwd
TCraft Stbd Fy	54			NA	NA	NA	82.01	3.76	2.12	+ TC push port
TCraft Stbd Fz	55			NA	NA	NA	80.28	2.65	2.06	+ TC push up
LMSR Port Fx	56	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	144.15	11.57	8.50	+ TC push fwd
LMSR Port Fy	57			NA	NA	NA	142.74	12.75	10.48	+ TC push port
LMSR Port Fz	58			NA	NA	NA	143.93	11.57	8.28	+ TC push up
LMSR Stbd Fx	59	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	144.94	7.59	8.50	+ TC push fwd
LMSR Stbd Fy	60			NA	NA	NA	143.81	6.02	10.48	+ TC push port
LMSR Stbd Fz	61			NA	NA	NA	144.72	7.56	8.28	+ TC push up
Fx Total TCraft	62	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fx Total LMSR	63	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total TCraft	64	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total LMSR	65	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fz Total	66	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA

Note: Long. Locations are relative to the stem, Trans. Locations are relative to C_L and Vertical Locations are relative to top of the weather deck.
(All Dimensions are in Inches)

Table 8. Ramp (Hinged), carriage channels, and other instrumentation list

Channel Name	Ch #	Manufacturer	Type Transducer	Model	Serial Number	BarCode	Long. Location (hinged)	Trans. Location (hinged)	Vertical Location (hinged)	Polarity
Time	1	NA	NA	NA	NA	NA	-	-	-	always +
Carr Speed	2	NA	Encoder	NA	NA	NA	-	-	-	always +
North Wave Ht	3	Senix Corporation	Senix Ultrasensor-S	TS-30S	106045	039340	-	-	-	+ up
South Wave Ht	4				106063	039334	-	-	-	+ up
West Wave Ht	5		Senix TSPC Tough Sonic	TS-30S	4120479	NA	-	-	-	+ up
Port Wave Ht	6				4120475	NA	-	-	-	+ up
Stbd Wave Ht_tc	7				4120476	NA	-	-	-	+ up
L Accel Ramp	36	Crossbow	Tri-Axial Linear Accelerometer	CXL02LF3	9914974	039297	105.64	ON C_L	6.90	+ accel fwd
T Accel Ramp	37									+ accel port
V Accel Ramp	38									+ accel up
Hinge Port Fx	67	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	98.12	3.44	1.53	+ TC push fwd
Hinge Port Fy	68			NA	NA	NA	99.54	5.31	1.57	+ TC push port
Hinge Port Fz	69			NA	NA	NA	97.90	3.44	1.31	+ TC push up
Hinge Stbd Fx	70	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	98.12	3.44	1.53	+ TC push fwd
Hinge Stbd Fy	71			NA	NA	NA	99.54	5.31	1.57	+ TC push port
Hinge Stbd Fz	72			NA	NA	NA	97.90	3.44	1.31	+ TC push up
LMSR Port Fx	56	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	98.74	3.03	7.19	+ TC push fwd
LMSR Port Fy	57			NA	NA	NA	98.20	4.91	6.89	+ TC push port
LMSR Port Fz	58			NA	NA	NA	98.51	3.03	6.98	+ TC push up
LMSR Stbd Fx	59	NSWCCD	350 Ohm Strain Gage Bridge	NA	NA	NA	98.74	3.03	7.19	+ TC push fwd
LMSR Stbd Fy	60			NA	NA	NA	98.20	4.91	6.89	+ TC push port
LMSR Stbd Fz	61			NA	NA	NA	98.51	3.03	6.98	+ TC push up
Fx Total TCraft	62	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fx Total LMSR	63	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total TCraft	64	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fy Total LMSR	65	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Fz Total	66	NA	Calculated Ch.	NA	NA	NA	-	-	-	NA
Nano Fx	**NA**	Industrial Automation (ATI)	Nano 6-Axis Sensor	Nano 25 IP65	FT09682	NA	76.50 FWD	ON C_L	0.56 ABV	+ PL push fwd
Nano Fy	**NA**									+ PL push port
Nano Fz	**NA**									+ PL push down
Nano Mx	**NA**									+ lift port side PL
Nano My	**NA**									+ lift aft end PL
Nano Mz	**NA**									+ fwd end to stbd

Note: Long. Locations are relative to the stem, Trans. Locations are relative to C_L and Vertical Locations are relative to top of the weather deck.
(All Dimensions are in Inches)

The Qualisys tracking system used reflective spheres to determine 6-DOF motion data for the multiple bodies. In the case of these experiments, a plate of four reflective spheres was fastened to both the T-Craft and the LMSR. Since the spheres on each plate were separated by known distances, the motions of both bodies could be calculated. Note that the motions that were

calculated are at the origin of each plate and not necessarily at each model's CG. The locations of the plate origins for the T-Craft and LMSR models appear in Tables 4 and 5 respectively.

Columbia accelerometers were used to measure the accelerations at three locations on the LMSR: the bow, CG, and stern. Additionally, two block gages were used in series to determine the drag and side forces exerted by the models on the heave staff (pogo stick).

The instrumentation list in Table 6 begins with hardware that was mounted to the carriage. Carriage speed was measured using an encoder that was brought into the data acquisition system using a frequency-to-voltage card in the HBM system.

The waves produced in the model basin were measured using five sonic transducers. These sonic transducers were mounted on the MASK carriage to measure the wave heights in front of and around the T-Craft and LMSR models. Wave height channels, labeled "North", "South", and "West", reflect the fixed relative positions they occupied on the MASK carriage. The West sonic was located on the front side of the MASK carriage on a boom that positioned the sonic in front of the LMSR hull. The boom allowed the West sonic to measure waves free from any reflections from the LMSR model.

Next on the instrumentation list are the strain gages that were used to measure the loads at the ramp attachment points. The strain gage name is used to denote the attachment point, i.e. "T-Craft" in its channel name indicates that measurement was made on the side of the ramp that mated with the T-Craft. The directionality of the force measurement is denoted by the subscript where "F_x" indicates that a force in the longitudinal axis is being measured.

The strain gages were bonded to small aluminum cantilevered beams called "pedestal load cells" and link arm load cells. These load cells were designed and built by Code 65 at NSWCCD. Figure 23 shows a photograph of one of four pedestal load cells and link arm assemblies that were used during testing.

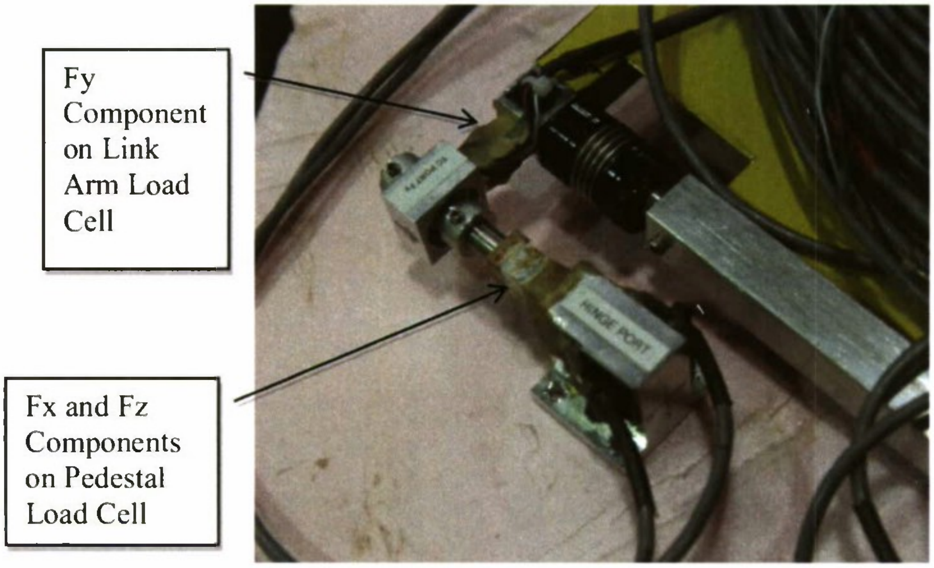


Figure 23. Photograph of a pedestal load cell with F_x and F_z strain gages

The pedestal load cells had two strain gage bridges; one for longitudinal force (F_x), and one for vertical force (F_z). Figure 14 shows additional detail on gage pairing and alignment associated with all three orthogonal force measurements. The pedestal load cells are essentially cantilever beams oriented to resist deformation in the direction normal to the plane of the gages.. To measure force orthogonal to the X and Z axis an additional cantilever or link load cell was added connecting the pedestal load cell with the ramp. The link is only sensitive to the transverse force (F_y) that is acting at each end of both longitudinal members supporting the ramp. The strain bridge output was converted to force using a series of calibrations described in previous sections. The cross-sectional area at each gage section was optimized so that good resolution was achieved for small loads and adequate strength was available to withstand extreme loads or accidental overloads. The square cross section also provided a means to generate orthogonal pairs. The load cells and the ramp were designed to provide quasi static loads related to wave energy and do not represent a scaled structure. The ramp and load cell system was given structural properties by installing bellows connectors at the four corners of the ramp. This connectivity provided a low torsional stiffness allowing for flexure expected for an open section ramp structure. Acting alone the bellows were too flexible so additional thin sheathing (seen as yellow material in the photographs) was added to the ramp for additional stiffness.

In the case of the Hinged configuration, a Nano 6-axis force sensor was used to measure the ramp foot inertial load on the deck of the T-Craft model. Photographs of the Hinged configuration and a close-up of the Nano are shown in Figure 24.

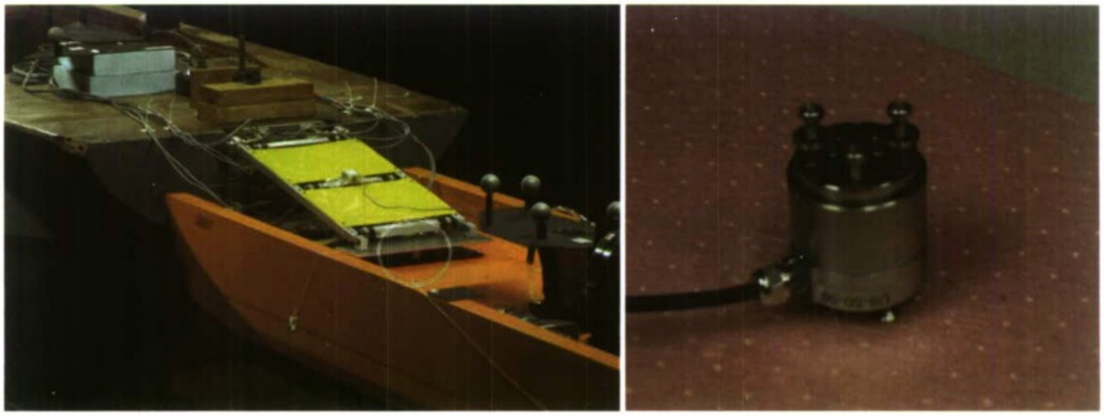


Figure 24. Hinged configuration with Nano setup (left) and Nano close-up (right)

In the Hinged configuration, the foot of the ramp was free to slide along an aluminum plate. The Nano was sandwiched between this plate and the top of the weather deck of the T-Craft. Forces due to friction from the foot of the ramp sliding on the aluminum plate, the moments created by the position of the foot of the ramp, and inertial loads from the ramp were then measured. These Nano channels were collected through LabView software using a separate data acquisition system.

Environmental conditions are typically measured whenever an ACV or SES model test is conducted. A Davis weather station was used to measure air temperature, air pressure, and humidity during the test. The weather station was placed on the MASK carriage, approximately 9 ft above the water surface. While the air temperature on the carriage was noticeably different from the air temperature near the water surface, the weather station gave a good point measurement of the environmental conditions in the MASK.

A Hobo U12 stainless water temperature data logger was placed underwater near the surface of the water and was lifted out of the water only twice during the test period. Figure 25 shows the environmental data collected from the Davis weather station and Hobo. The extremes and the average values are shown in Table 9.

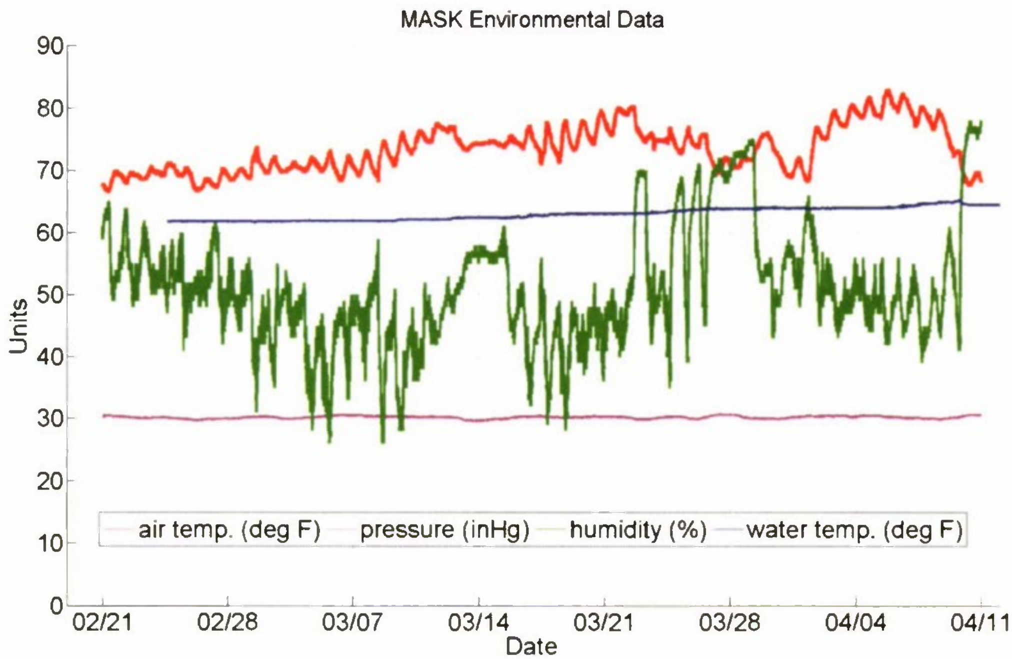


Figure 25. MASK environmental conditions

Table 9. Summary of MASK environmental conditions

	Min	Max	Average
Air Temp (deg F)	66.4	83.1	73.4
Air Pressure (in Hg)	29.6	30.7	30.2
Humidity (%)	26.0	78.0	50.8
Water Temp (deg F)	61.7	65.4	63.0

WAVE ENVIRONMENT

Waves produced in the model basin were measured by five Senix sonic transducers. These sonic transducers were mounted on the MASK carriage to measure wave heights in front of and on both sides of the MASK carriage and in close proximity to the seabase. Wave height channels, labeled North, South, and West, reflect the fixed relative positions they occupied on the MASK carriage. Two "Mini" sonics located to the windward and lee sides and ahead of the T-Craft measured waves incident to the T-Craft bow. The West sonic was located ahead of the

front side of the MASK Carriage on a boom. The boom was extended to a position in front of the LMSR model. The South sonic was located on the port side of the seabase, adjacent to the LMSR transom. The North sonic was located on the starboard side of the LMSR. All of the sonic locations are documented on the setup drawings presented in Figures 1-3.

A plan view of the MASK Test Basin at NSWCCD is provided in Figure 26. The wave basin has pneumatic wave makers on two sides of a rectangular basin. Opposite sides are equipped with energy absorbing beaches that attenuate most of the wave energy generated by the wave makers.

Sea State 3 and Sea State 4 wave environments were specified in the T-Craft test matrix. According to the NATO Sea State Table, the average significant wave height for Sea State 3 is 2.89 feet (0.88 meters) and for Sea State 4 is 6.17 feet (1.88 meters). Modal wave periods for each sea state were selected to cover the range of modal periods specified in the NATO Sea State Table. The Sea State 3 modal wave periods selected were 7.5 and 10.0 seconds. The Sea State 4 modal wave periods selected were 8.8 and 11.3 seconds. As stated previously, the wave conditions investigated included a high Sea State 3 (4.10 foot (1.25 meter) significant wave height) condition with modal periods of 7.5 and 10 seconds, a high Sea State 4 with 2.5 meters significant wave height at 11.3 second modal period, and a 8.2 foot (1.88 meter) significant wave height bi-modal spectrum with energy peaks at 7.5 and 15 seconds. Figures 27 to 32 present sample measured wave spectra for all sea conditions tested. In each of these figures, the idealized Bretschneider and measured spectra are presented.

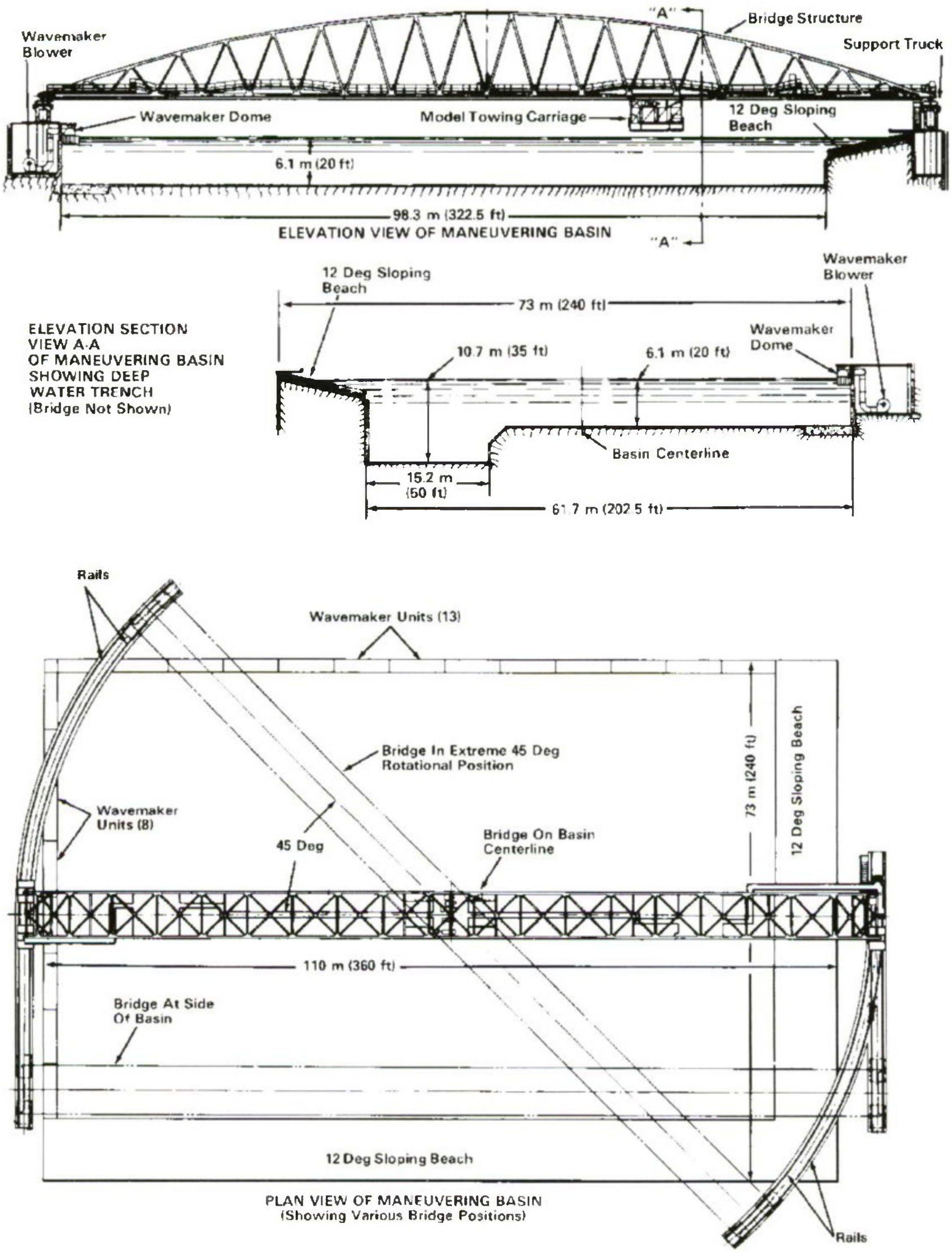


Figure 26. NSWCCD MASK basin

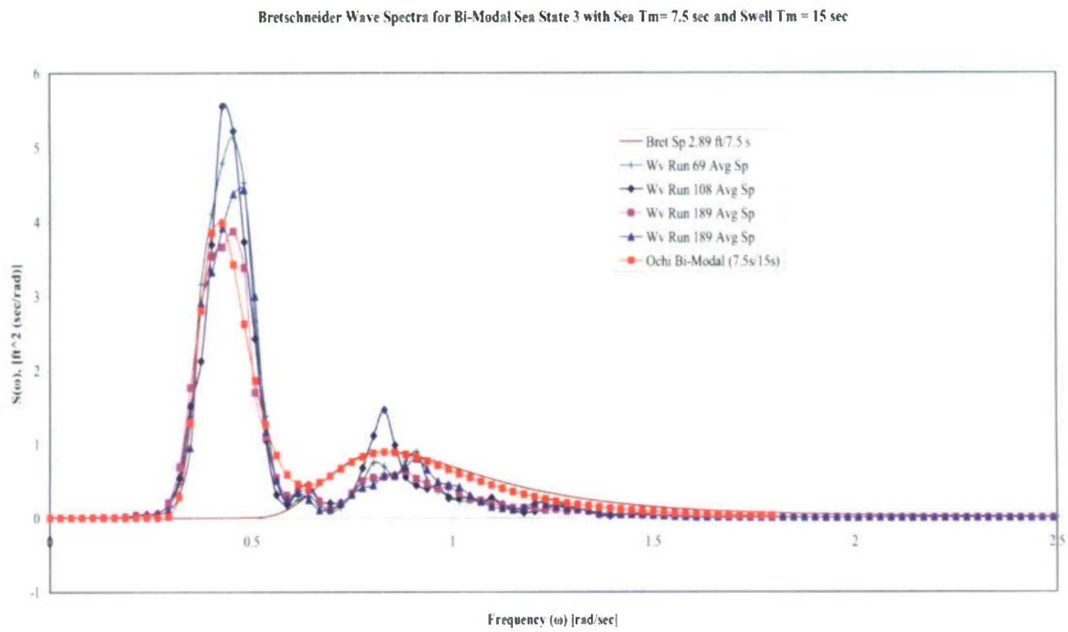


Figure 27. Bi-Modal Sea State 3 (7.5 and 15 second modal period peaks) spectrum

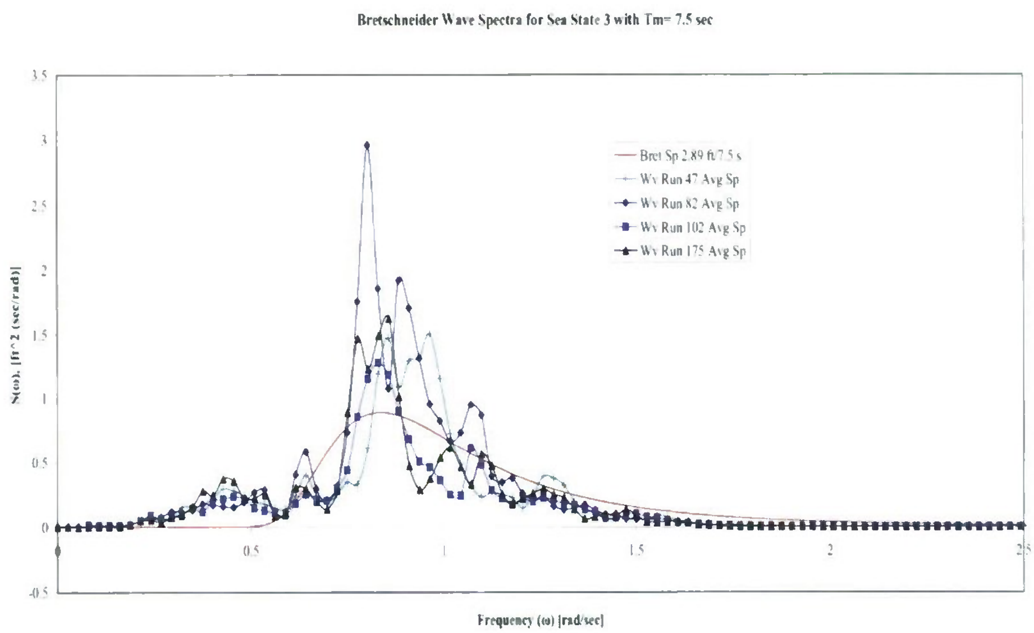


Figure 28. Sea State 3 (7.5 second modal period) spectrum

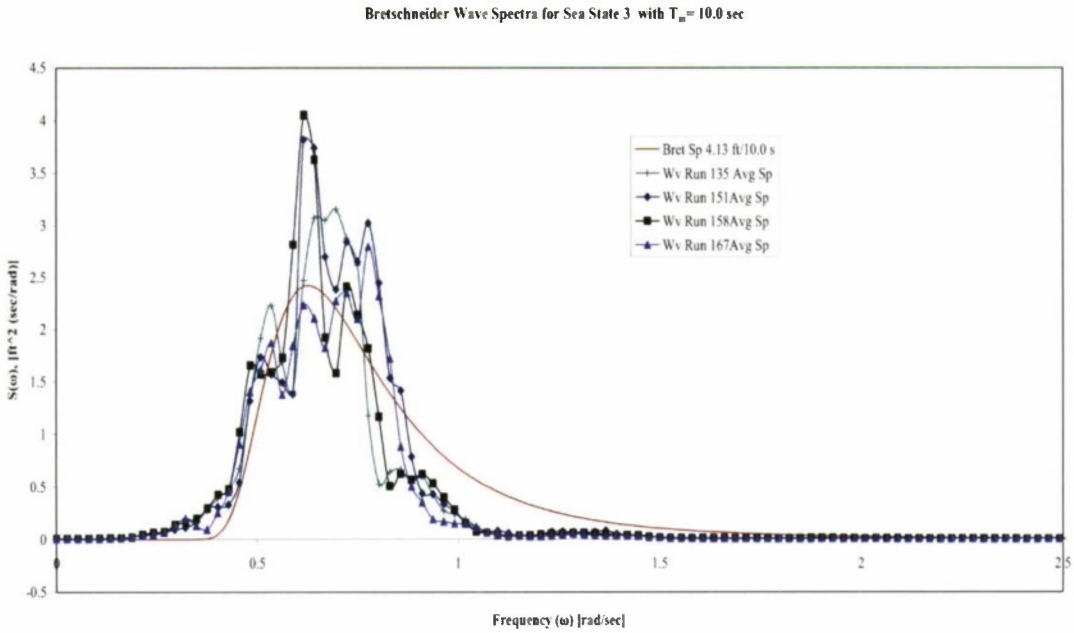


Figure 29. Sea State 3 (10 second modal period) spectrum

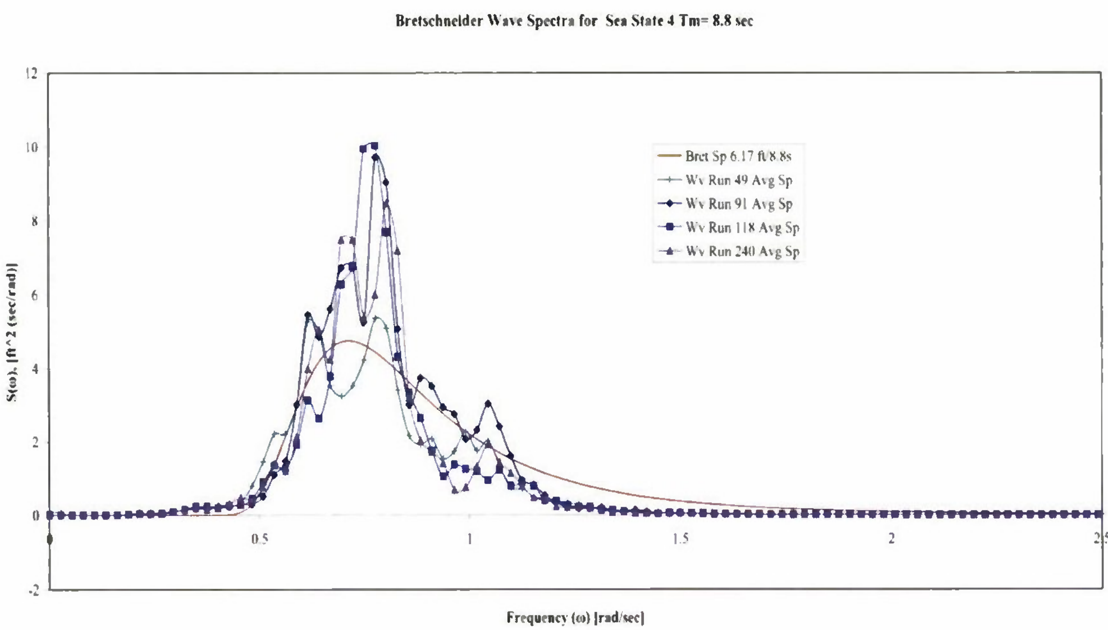


Figure 30. Sea State 4 (8.8 second modal period) spectrum

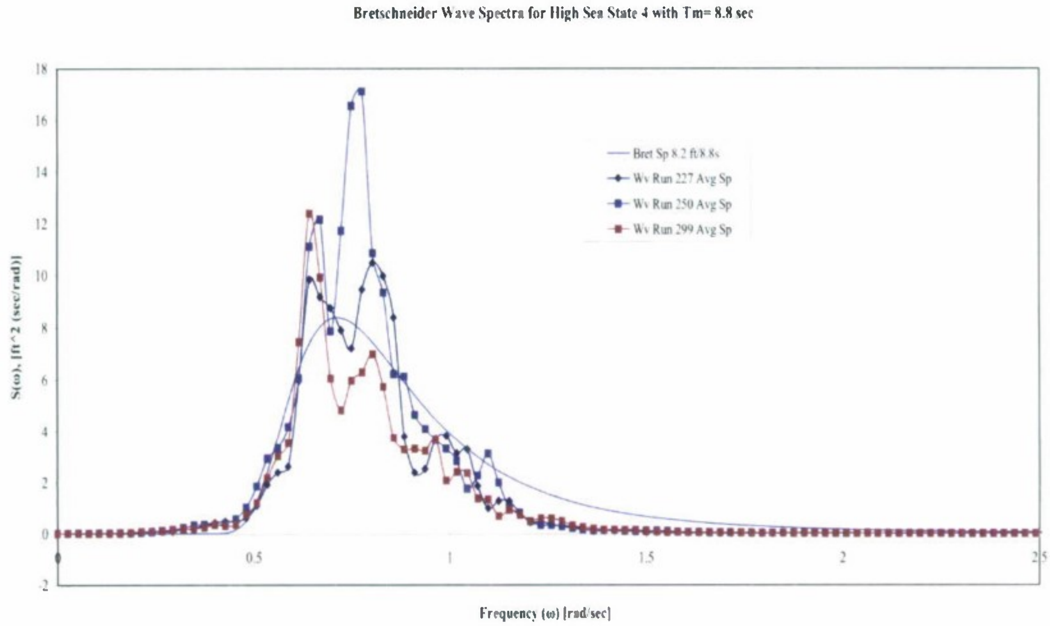


Figure 31. Sea State 4 (11.3 second modal period) spectrum

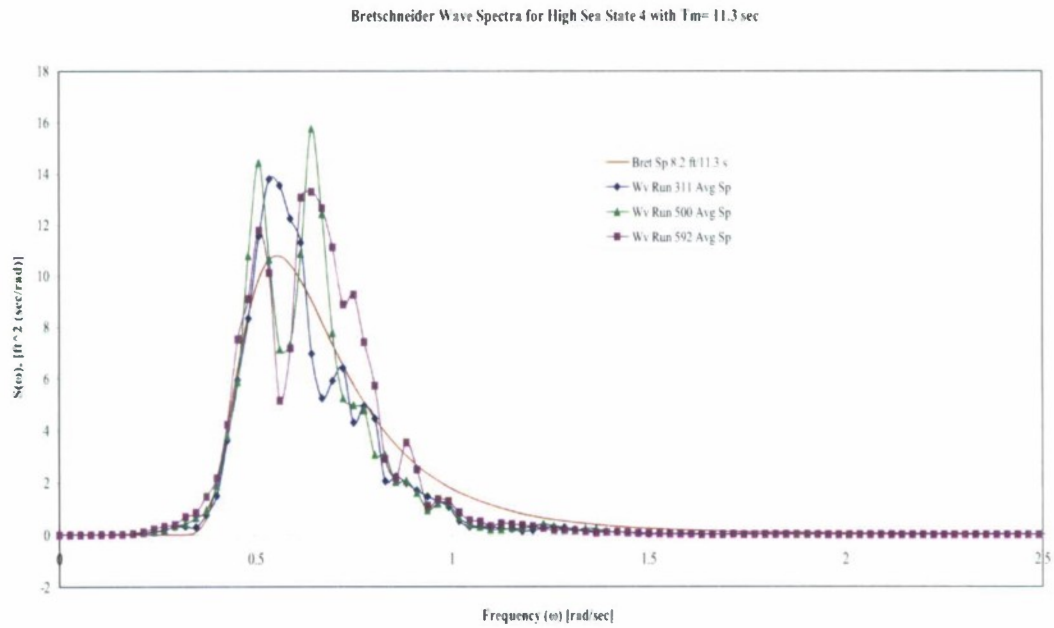


Figure 32. High Sea State 4 (11.3 second modal period) spectrum

UNCERTAINTY ANALYSIS

Approach

Uncertainty analysis applied to this report is based upon the ISO GUM [1] and ITTC Procedure 7.5-02-01-01 [3]. The analysis consists of two methods of evaluation: Type A and Type B. For this report, all uncertainties are defined at the 95% confidence limit (U95). The Type A expanded uncertainty is computed from the time series data acquired during the test and is defined in Equation (1) for the mean value:

$$U_A = ks_x / \sqrt{n} \tag{1}$$

Where the standard deviation or standard uncertainty of x is

$$u^2 = s_x^2 = [1/(n-1)]\sum_{i-1}^{x}(x_i - < x >)^2 \tag{2}$$

and the mean of x is

$$< x >= (1/n)\sum_{i=1}^{n} x_i \tag{3}$$

where n is the number of samples and k is the coverage factor. Normally at the 95% confidence level, k equals 2; however, the inverse Student-t may be applied for small sample sizes. These tests are usually highly unsteady and random in character.

The Type B uncertainty is determined from calibration of the instruments. For most electronic instruments, the uncertainty in the reference standards is small in comparison to the uncertainty in the electronic transducers. For conversion of the voltages from the A/D (analog to digital) converter or data acquisition card (DAC) in the data acquisition system to engineering units or physical units, the slopes and intercepts from regression analysis of the calibration data are applied to the data analysis. The uncertainty is determined by calibration theory from ITTC Procedure 7.5-01-03-01 [4]. Additional details are described in Scheffe [5] and Carroll, et al. [6].

Calibrations are performed by an end-to-end or through system calibration. The calibration data are acquired with the same data acquisition system that is used during the test and provides information for the conversion of computer Volts on the DAC to engineering units. The uncertainty in calibration then consists of three elements: (1) uncertainty in the reference standard (2) Type A uncertainty from Equation (1) during the data collection process, and (3) the

uncertainty in the curve fit from calibration theory. Typically, the uncertainty from the Type A is relatively small since most instruments have low noise levels.

For those quantities not measured directly such as acceleration of gravity, Froude number, and non-dimensional wavelength and height, the uncertainties are propagated to obtain the combined uncertainty from the following equation from [1] and [3].

$$U_c^2 = \sum_{i=1}^{N} [(\partial f / \partial x_i) U(x_i)]^2 \tag{4}$$

This equation is applicable to uncorrelated or statistically independent measurement quantities.

For this test series, the instruments were calibrated twice: January and February 2010 (pre-test calibration), and April and May 2010 (post-test calibration). Only the pre-test results are presented here. The post-test calibration agreed with the pre-test calibration within 3% for the highest loading condition. The calibration results are summarized in Table 10. These results are optimal, as some outliers have been removed. Actual data acquired during the test may have slightly higher calibration uncertainty. Typically, in a surface ship model test, the probability of the results at the 95 % confidence limit will be larger than the calibration uncertainty, especially when surface waves are involved.

Acceleration

Applied Geomechanics Pro 3600 and Tilt Table

A total of 5 triaxial accelerometers were located on the models for this test: 2 Columbia Model SA-307TX and 3 Crossbow CXL02LF3. Acceleration is referenced to local acceleration of gravity, g, by a tilt table with a resolution of 10 minutes of arc. The tilt table had an uncertainty of ±0.05°. The angles were checked with an Applied Geomechanics Pro 3600 Digital Protractor, which has a resolution of 0.1° and uncertainty of ±0.2°.

Acceleration Calibration by Inclination

The local acceleration of gravity sensed by the accelerometer is altered by the tilt angle. The value of the acceleration for longitudinal acceleration are given by

$$du/dt = \dot{u} = -g \sin\theta \tag{5a}$$

$$(du/dt)/g = \dot{u}/g = -\sin\theta \tag{5b}$$

for the transverse acceleration

$$dv/dt = \dot{v} = g\sin\varphi \tag{6a}$$

$$(dv/dt)/g = \dot{v}/g = \sin\varphi \tag{6b}$$

and for the vertical acceleration

$$dw/dt = \dot{w} = g(\cos\varphi - 1) \tag{7a}$$

$$(dw/dt)/g = \dot{w}/g = \cos\varphi - 1 \tag{7b}$$

where g is local acceleration of gravity and θ and φ are the tilt angles in pitch and roll, respectively. The above results are applicable to the Columbia accelerometers in ship coordinates. The signs for the Crossbow accelerometers are opposite to that of the Columbia.

Since the accelerometers are calibrated by inclination, the uncertainty in acceleration must be computed from the law of propagation of uncertainty from ISO[2]. The uncertainty in acceleration from the uncertainty in angle of inclination is then as follows with application of Equation (4) to the acceleration Equations (5) through (7).

From equation (5), the standard uncertainty in longitudinal acceleration is

$$u_{\dot{u}}/g = (\cos\theta)u_{\theta} \tag{8}$$

For transverse acceleration from Equation (6)

$$u_{\dot{v}}/g = (\cos\varphi)u_{\varphi} \tag{9}$$

For vertical acceleration in roll from Equation (7)

$$u_{\dot{w}}/g = |\sin\varphi| u_{\varphi} \tag{9}$$

The uncertainty in local g from the uncertainty in tilt angle is shown in Figure 33. From this figure, the uncertainty in g from calibration with the digital protractor can be large in comparison to the manufacturer's specification of 0.1 % or 1 mg (0.001 g) for a 1 g range transducer. However, calibration with the calibrated settings of the tilt table with a measured uncertainty of ±0.05° yields an uncertainty much smaller.

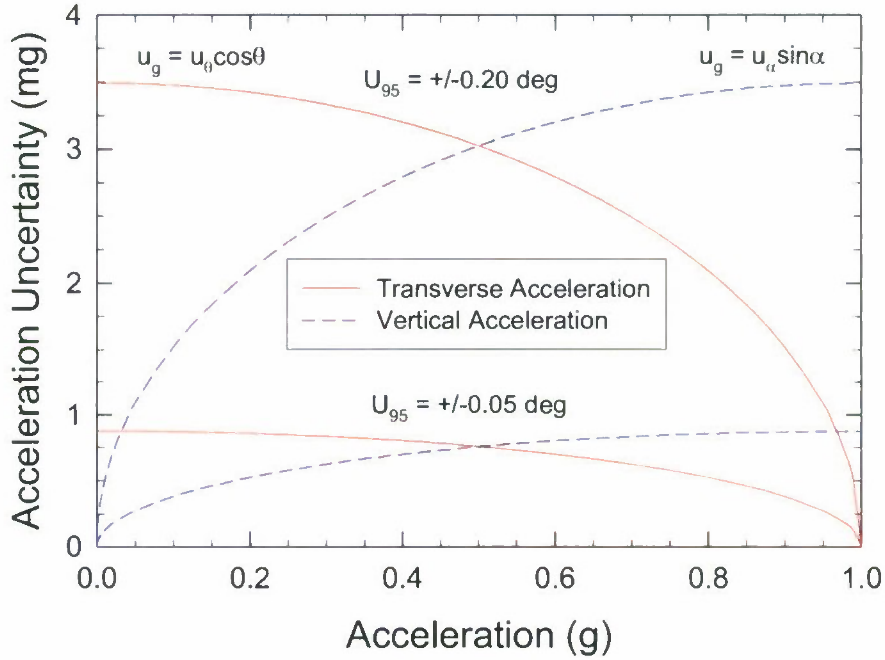


Figure 33. Uncertainty in g from Uncertainty in tilt angle

Local Acceleration of Gravity

Local gravity in absolute units from Moose [7] is 9.80100 ±0.00004 m/s^2 at the MASK. This value was computed from the National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey (NGS) of the U. S. Department of Commerce, with a latitude of 38° 58' 25" and longitude of 77° 11' 20". As a comparison, standard gravity is 9.80665 m/s^2. Thus, the difference from standard gravity at the MASK is 0.058 %.

Columbia Triaxial Accelerometer

Example plots of the residuals in calibration of acceleration are shown in Figure 34 for the Columbia model SA-307TX, where the residuals are the differences between the data and the straight line fit from linear regression analysis. The dashed lines are the calibration uncertainties at the 95% prediction limit from statistical calibration theory while the error bars are the uncertainty in the measurement during calibration. This convention is applied to the plots in this section. In this calibration, the uncertainty bars are from a combination of the Type A uncertainty calculated during acquisition of the data and the Type B from the calibration

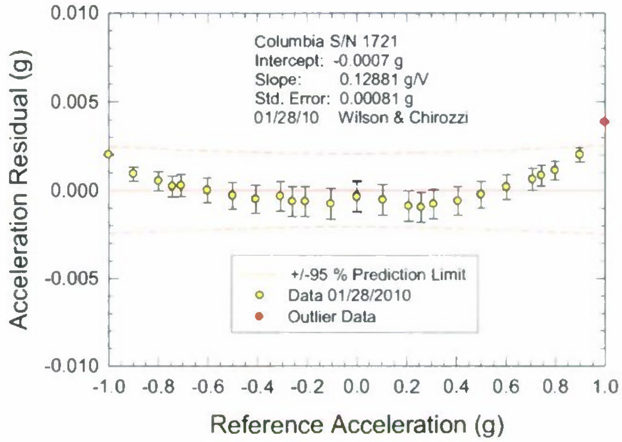
uncertainty of the reference angle. The uncertainty bars from thc tilt table are readily apparent. Most of the uncertainty is from uncertainty in the curve fit from calibration theory. The calibration uncertainty is larger than the manufacturer's specification on accuracy.

For the longitudinal acceleration in Figure 34, the calibration point at +1 g (-90°) was an outlier and was excluded from the curve fit. Removal of this point probably reduces the uncertainty slightly; however, the model may never attain this lcvel of acceleration in the longitudinal direction during the test.

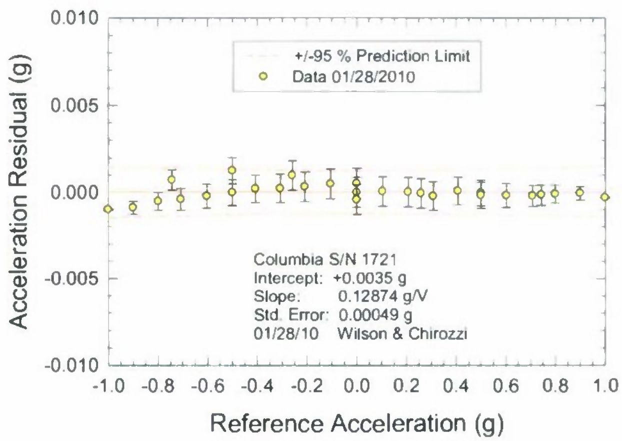
Crossbow Triaxial Accelerometer

Example plots of the residuals for Crossbow model CXL02LF3 are presented in Figure 35. As these figures indicate, the uncertainty in the calibration of this transducer is much larger than that of the Columbia in Figure 34. From Table 10, the uncertainties in most of the calibrations for the Crossbow were within the manufacturcr's specification of ±0.030 g in accuracy. In all cases for these transducers, outliers occurred at ±1 g (±90°) for the longitudinal and transverse components of acceleration. Since existing data werc not post-processed with these data, the uncertainty in calibration during the test will bc slightly highcr. If the accelerations during the test are within 0.9 g, the calibration data with the outliers removed is permissible.

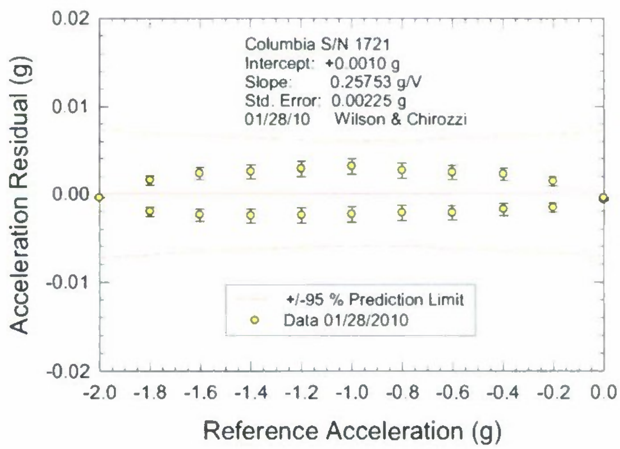
The systematic variation in the data is an indication of the non-linearity of the calibration. However, this variation may be an artifact of the calibration method. That is, the accelerometers are calibrated as inclinometcrs and then convertcr to acceleration. Application of a normal (perpendicular) acceleration with a device such as a shaker table may yield a different result.



a. Longitudinal acceleration

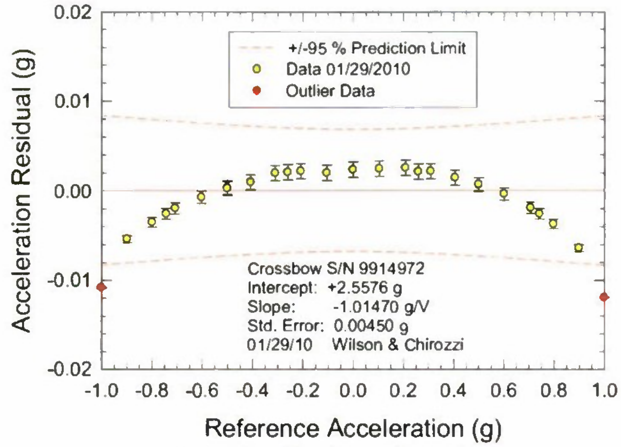


b. Transverse acceleration

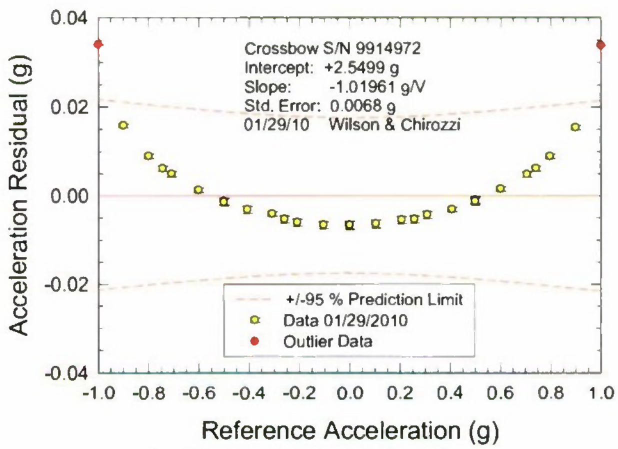


c. Vertical acceleration

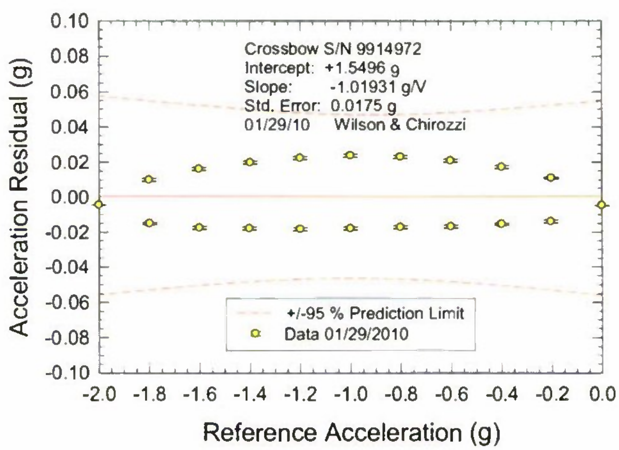
Figure 34. Residuals for Columbia accelerometer SN 1721 calibration



a. Longitudinal acceleration



b. Transverse acceleration



c. Vertical acceleration

Figure 35. Residuals for Crossbow accelerometer SN 9914972 calibration

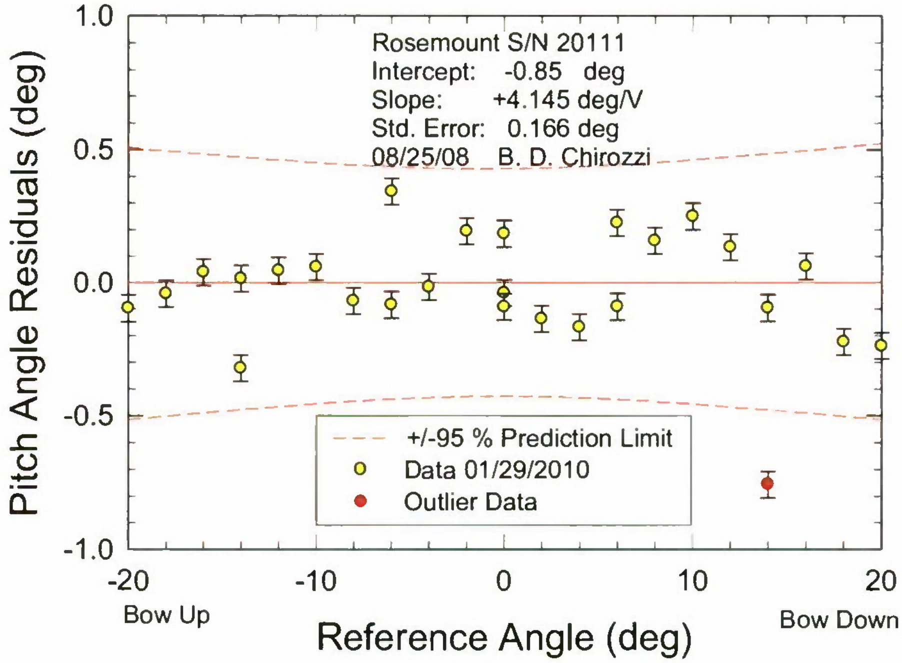
Table 10. Summary of calibration constants

Manufac.	Model #	Serial #	Function	Cal Date	Units	CH	Slope	Intercept	Correl.	Std Error	U95	Spec.
Columbia	SA-307TX	1643	Stem Vert	25-Jan-10	g	17	0.25752	0.0025	0.999996	0.00185	0.0060	0.0020
Columbia	SA-307TX	1643	Stem Trans	25-Jan-10		16	0.12890	0.0033	1.000000	0.00050	0.0016	0.0010
Columbia	SA-307TX	1721	CG Vert	28-Jan-10	g	15	0.25753	0.0010	0.999994	0.00225	0.0073	0.0020
Columbia	SA-307TX	1721	CG Trans	28-Jan-10		14	0.12874	0.0035	1.000000	0.00049	0.0015	0.0010
Columbia	SA-307TX	1721	CG Long	28-Jan-10		13	0.12881	-0.0007	0.999999	0.00081	0.0032	0.0010
Crossbow	CXL02LF3	0017176	Bow Vert	29-Jan-10	g	32	-1.01350	1.5642	-0.999657	0.0167	0.0551	0.030
Crossbow	CXL02LF3	0017176	Bow Trans	29-Jan-10		31	-1.01705	2.5089	-0.999907	0.0075	0.0229	0.030
Crossbow	CXL02LF3	9914972	CG Vert	29-Jan-10	g	35	-1.01931	1.5496	-0.999626	0.0175	0.0576	0.030
Crossbow	CXL02LF3	9914972	CG Trans	29-Jan-10		34	-1.01961	2.5499	-0.999922	0.0068	0.0210	0.030
Crossbow	CXL02LF3	9914972	CG Long	29-Jan-10		33	-1.01470	2.5576	-0.999988	0.0027	0.0081	0.030
Crossbow	CXL02LF3	9914974	Stem Vert	29-Jan-10	g	38	-1.01854	1.5782	-0.999888	0.0095	0.0312	0.030
Crossbow	CXL02LF3	9914974	Stem Trans	29-Jan-10		37	-1.01866	2.5402	-1.000000	0.0002	0.0011	0.030
Crossbow	CXL02LF3	9914974	Stem Long	29-Jan-10		36	-1.02069	2.6611	-0.999959	0.0050	0.0152	0.030
Rosemount	VG34-0803-3	20111	Roll	29-Jan-10	deg	26	-6.022	0.637	-0.999982	0.072	0.227	1.0
Rosemount	VG34-0803-3	20111	Pitch	29-Jan-10		27	4.145	-0.854	0.999901	0.166	0.525	1.0
Rosemount	VG34-0803-3	20123	Roll	29-Jan-10	deg	8	-5.837	1.218	-0.999637	0.254	0.825	1.0
Rosemount	VG34-0803-3	20123	Pitch	29-Jan-10		9	3.851	-0.896	0.999956	0.093	0.305	1.0
Celesco	PT1DC-30	K1305322A	Heave	1-Feb-10	inches	10	-2.0052	-15.142	-0.999998	0.0183	0.0624	0.045
Omega	PX163-2.5BD5V	29	Spare	29-Jan-10	psf	39	5.142	-17.80	0.99991	0.0719	0.349	0.13
Omega	PX163-2.5BD5V	38	Stem Lobe P	29-Jan-10	psf	42	5.207	-18.70	0.99991	0.0710	0.347	0.13
Omega	PX163-2.5BD5V	49	Spare	29-Jan-10	psf	41	5.202	-18.70	0.99992	0.0675	0.336	0.13
Omega	PX163-2.5BD5V	55	Aft Cushion P	29-Jan-10	psf	41	5.193	-18.26	0.99992	0.0687	0.340	0.13
Omega	PX163-2.5BD5V	56	Trans Seal P	29-Jan-10	psf	40	5.176	-18.26	0.99993	0.0654	0.330	0.13
Omega	PX163-2.5BD5V	151	Fwd Cushion P	29-Jan-10	psf	39	5.196	-18.38	0.99992	0.0669	0.335	0.13
Senix	Ultra-S	106045	N. Wave H.	1-Feb-10	inches	3	-2.9998	-9.949	-0.999992	0.0344	0.124	0.030
Senix	Ultra-S	106063	S. Wave H.	1-Feb-10	inches	4	-3.0175	-9.974	-0.999996	0.0240	0.087	0.030
Senix	TSPC30S1-232	4120475	TC Port Wave	1-Feb-10	inches	6	-3.0218	-9.585	-0.999993	0.0328	0.118	0.030
Senix	TSPC30S1-232	4120476	TC Stbd Wave	1-Feb-10	inches	7	-3.0041	-9.709	-0.999999	0.0159	0.059	0.030
Senix	TSPC30S1-232	4120479	W. Wave H.	1-Feb-10	inches	5	-3.0037	-9.615	-0.999997	0.0246	0.091	0.030

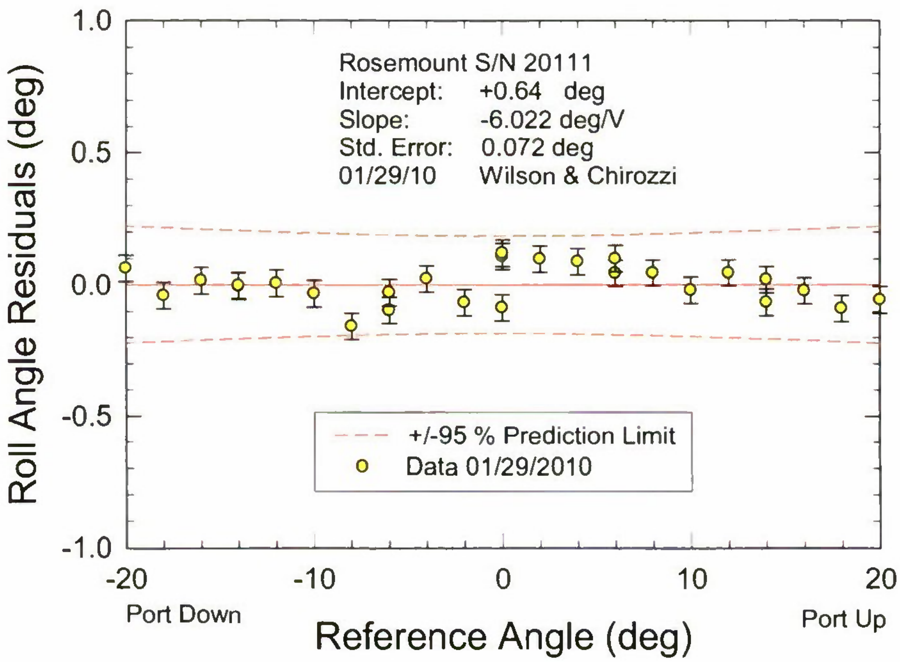
Pitch and Roll Angle

Rosemount/Goodrich Vertical Gyroscope

For this test series, pitch and roll angles were measured with a Goodrich/Rosemount Aerospace VG34-0809-1 vertical gyroscope, which was calibrated with the same equipment as the Columbia and Crossbow accelerometers. Example results for pitch and roll for the Rosemount are shown as residual plots in Figure 36. Calibrating the Rosemount and leveling of the tilt table with the Pro 3600 should be adequate since the Rosemount vertical gyroscope is nominally a ±1° device per the manufacturer's specification. The calibration results have a lower uncertainty than manufacturer's specification on accuracy.



a. Pitch angle



b. Roll angle

Figure 36. Residuals for Rosemount vertical gyroscope SN 20111calibration

Heave

Celesco Cable-Extension Position Transducer

Heave at the CG for DTMB model 5494 was measured with a Celesco PT1DC-30 cable-extension position transducer (string pot) with a measurement range of 30 in. (762 mm) and an accuracy of ±0.045 in. (±1.1 mm). Calibration results are shown in Figure 37. The Celesco was calibrated with an aluminum displacement calibration bar with precision hole locations. The average uncertainty in hole location is ±0.0125 in (±0.32 mm) with NIST traceability. The maximum estimated uncertainty in the Celesco is ±0.062 in. (±1.6 mm) or ±0.21 % full-range, which is slightly larger than the manufacturer's specification on accuracy of ±0.045 in (±1.1 mm).

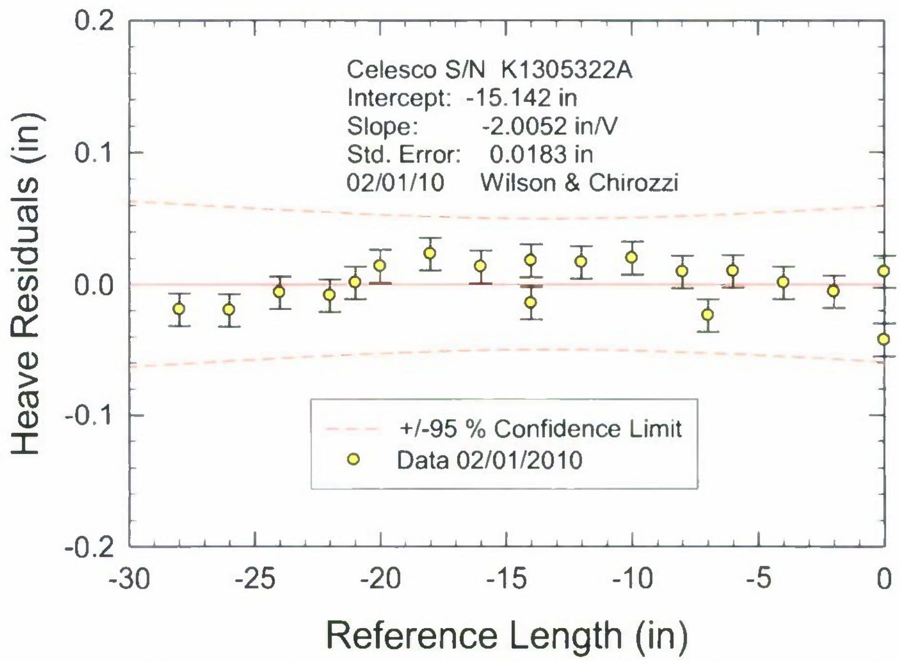


Figure 37. Residuals for Celesco SN K1305322A calibration in heave

Differential Pressure

Omega Differential Pressure Transducer

The differential pressures for DTMB model 5687 were measured at several locations with an Omega PX163-2.5BD5V pressure transducer with a range of ±2.5 inches of water (±0.623 kPa) or ±13 psf (lbf/ft^2). The manufacturer's specification on accuracy is 0.13 psf (±0.0062 kPa or ±1.0 % full-scale). The pressure transducers were calibrated with a Heise Volume Controller HVC-1000 and Mensor DPG (Digital Pressure Gage) 2400 with a range of ±5 psi (720 psf or 34 kPa) and accuracy of ±0.030 % full-scale (±0.22 psf or ±0.010 kPa). An example calibration is presented in Figure 38. The maximum calibration uncertainty in this case is ±0.35 psf (±0.017 kPa) or ±2.7 % full-scale. The uncertainty in the reference measurement is slightly larger than that from curve fit from calibration theory. Additionally, the uncertainty in the reference standard is higher than the manufacturer's specification on the accuracy of the Omega by a factor 1.7. A reference standard with a lower uncertainty should have been applied in the calibration.

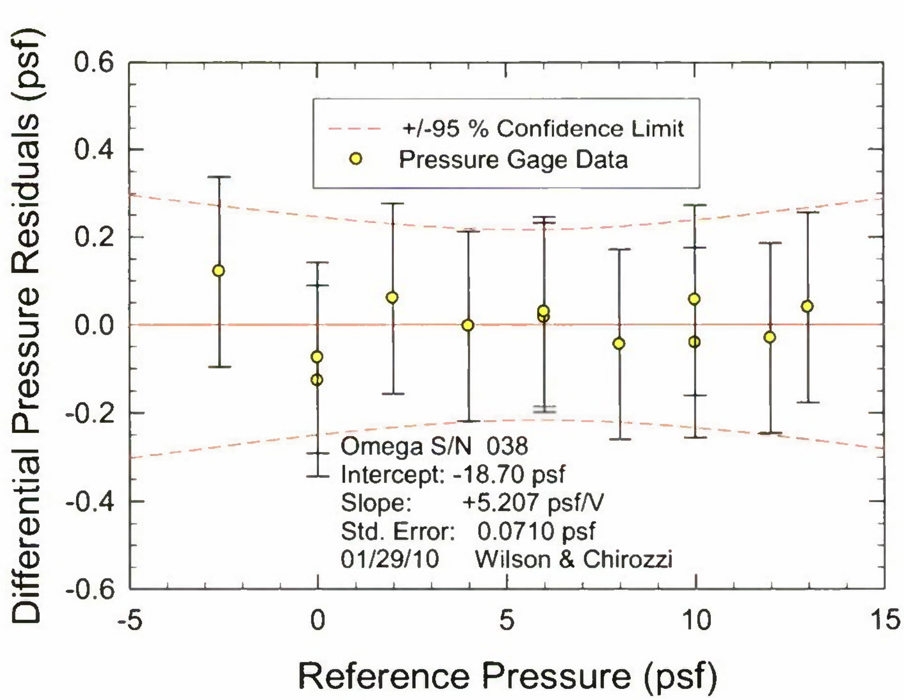


Figure 38. Residuals for Omega SN 038 calibration for differential pressure

Wave Height

Senix Ultrasonic Sensor

Wave heights near the models were measured with Senix ultrasonic transducers. Measurements were performed with two different models: Senix Ultra-S and Senix TSPC30S1-232. The performance of each was quite similar. The range of the transducers was 30 in. (762 mm) with an accuracy of ±0.1 % full-scale (±0.030 inches or ±0.76 mm). The reference length was a metal scale (Starrett model C636-1000) with a maximum length of 1000 mm (39.37 in.) and resolution of 1/64 in. (0.40 mm). The scale did not have a NIST traceable certificate, but the uncertainty was assumed to be ±0.01 in. (±0.25 mm). The results for a typical calibration are shown in Figure 39 for Senix SN 106045. Most of the uncertainty in the calibration is in the uncertainty in the curve fit. The maximum estimated uncertainty for the example is ±0.12 in. (±3.1 mm) or ±0.41 % full-range of 30 in.

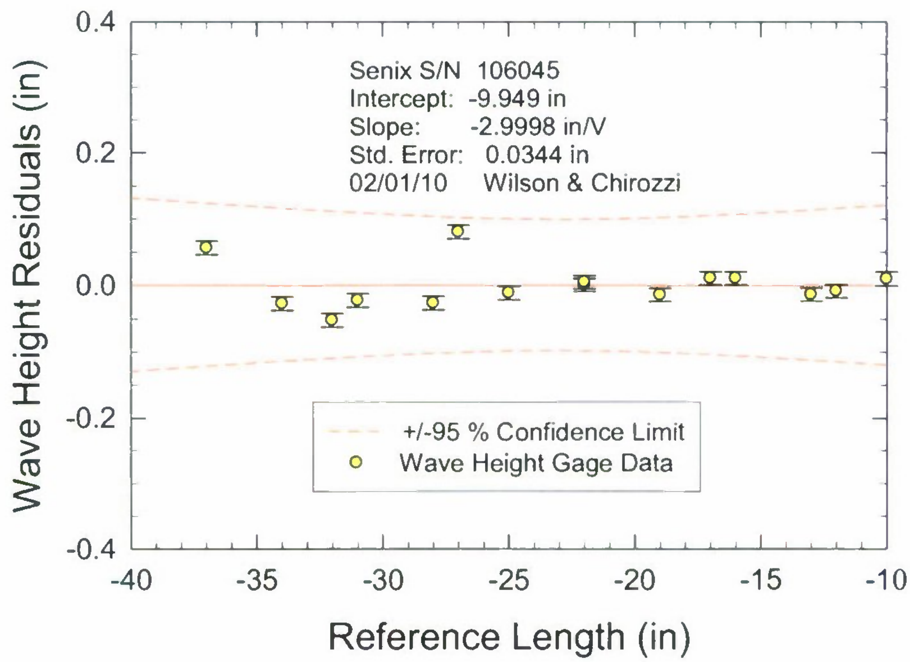


Figure 39. Residuals for Senix SN 106045 calibration for wave height

Model Instrumentation Summary

The calibration constants, statistics, and uncertainty estimates for most of the model instrumentation are listed in Table 10. Additional statistics in the tables include the correlation coefficient and the standard error of estimate (*SEE*). The correlation coefficient is a measure of the linearity. For perfectly correlated data, the correlation coefficient is 1.0. As the table indicates, most of the instruments have a value very nearly one to four decimal places with the smallest value of 0.99966 for Crossbow SN 17176 vertical acceleration. The *SEE* is a measure of the standard deviation and is in the same physical units as the instrument. It is also a measure of the uncertainty. For perfectly correlated data, *SEE* will be zero. Typically, 3**SEE* is near the estimated uncertainty in the 95 % prediction limit from calibration theory. The last column of the table, Spec., is the manufacturer's specification on instrument accuracy. The column, Ch, is the channel number on the data acquisition card.

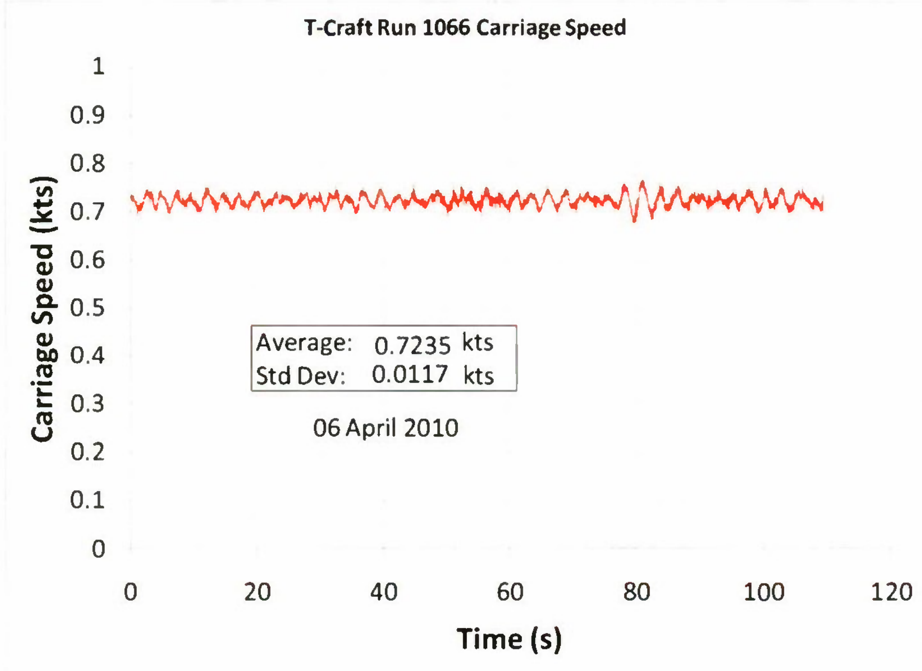
In general, the most critical items in Table 10 for all measurements are the slopes. The intercepts for the accelerometers, vertical gyroscope, Celesco string pot, and Senix wave height gages should be corrected based on zero measurements in calm water at zero model speed. Reproducibility during calibration requires that the tilt table be leveled with an instrument of lower uncertainty. In particular, the Pro 3600 has sufficient accuracy for leveling of the tilt table for the Rosemount vertical gyroscope but not the Columbia accelerometers. The intercept for the Omega differential pressure transducers is critical and should not be corrected for offset.

REPEATABILITY OF TEST RESULTS

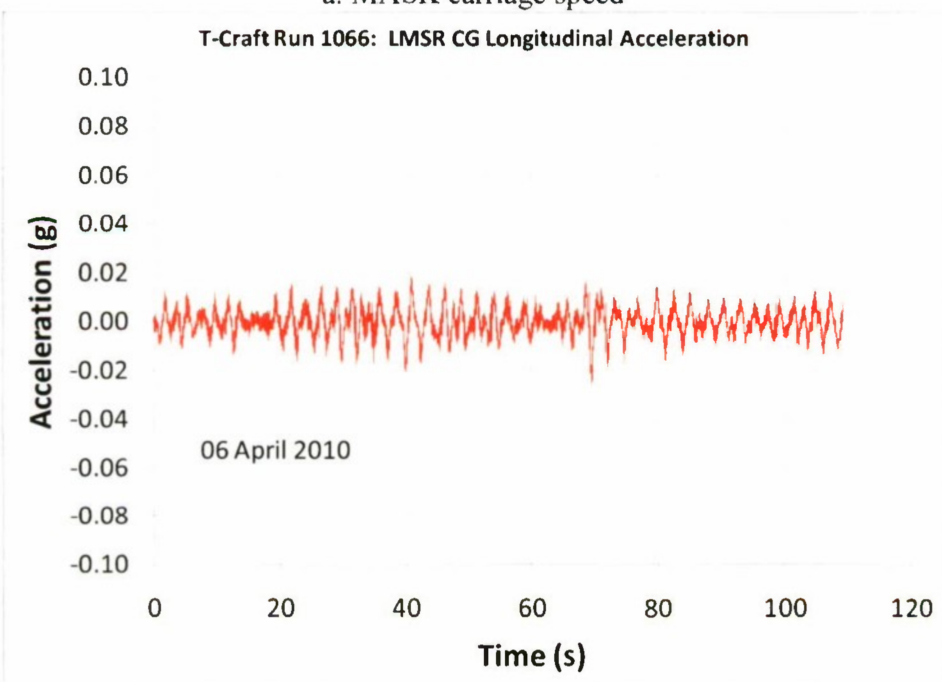
The true uncertainty in many cases for surface ship model testing is established with repeat tests. In particular, wave interaction with a model has statistical variability because the uncertainty in the performance of the wavemaker can be established only through repeat runs. In this test series, repeat runs at the same test condition were performed for run numbers 135 through 144 and runs 1065 through 1071. However, each run series had problems. For runs 135 through 144, the carriage speed data were lost. In runs 1065 through 1071, the Qualisys camera system was accidentally bumped, and the quality of the data may be in question. Thus, the data reported in this section are runs 135 through 144 with the carriage speed data from runs 1065 through 1071. Additionally, the data were analyzed for the first 100 only seconds since the

carriage systematically experienced acceleration at about 110 seconds for every run (see Figure 40 for run 1066). The results for all runs in this series were similar.

Although the Qualisys system has a calibration procedure, the calibration is not NIST traceable; consequently, no calibration uncertainty estimate is available. However, the data were compared for roll and pitch from the Rosemount vertical gyroscope on DTMB model 5494 (LMSR) and DTMB model 5687 (T-Craft) and for heave from the Celesco string pot on DTMB model 5494. All data were corrected for offset from the data at zero speed, and the Qualisys data for heave on the LMSR were corrected for CG location. A typical result for the comparison of the time history for run 135 in LMSR heave is shown in Figure 41 with the difference between the Qualisys heave and Celesco heave measurements. In this example, the average difference is 0.023 (0.58 mm) in with a standard deviation of 0.050 in. (1.2 mm) in comparison to the maximum uncertainty in the Celesco measurement of ±0.062 in. (±1.6 mm) from Table 10. The differences in the pitch and roll angles were less than the uncertainty in the Rosemount calibrations.

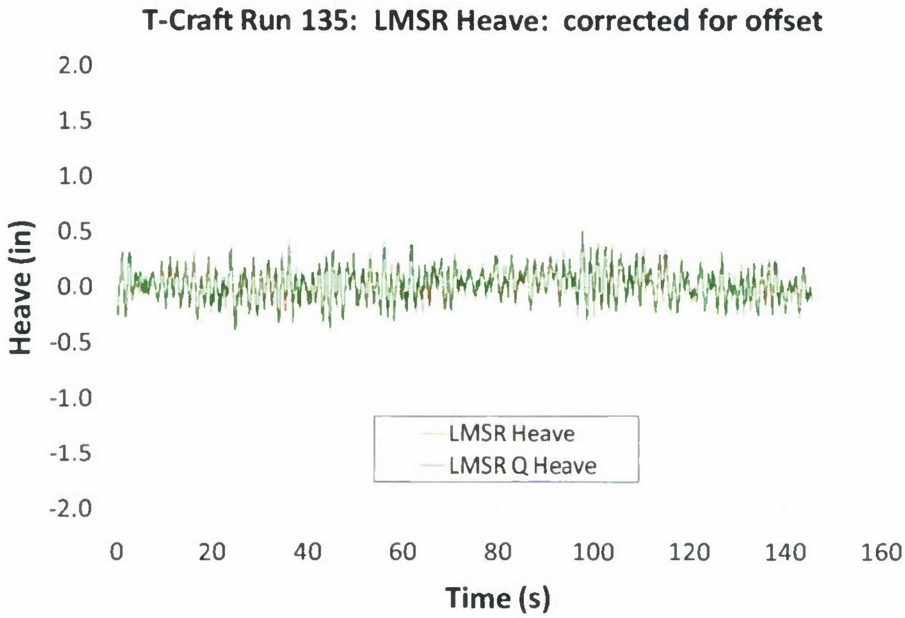


a. MASK carriage speed

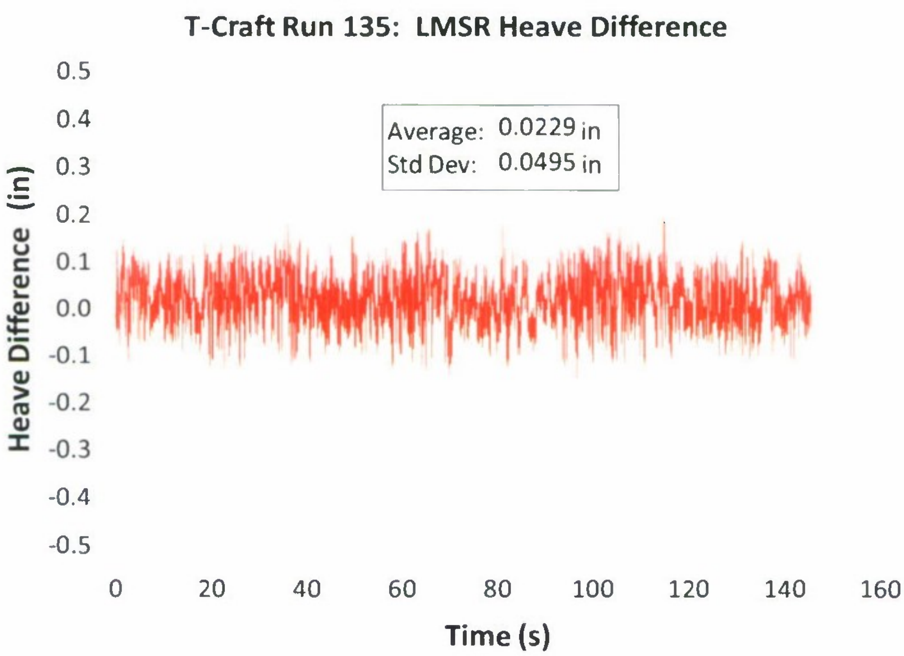


b. DTMB Model 5494 Longitudinal Acceleration at CG

Figure 40. MASK carriage data for Run 1066



a. Time histories of measurements



b. Difference of time histories

Figure 41. Comparison of heave measurements by Qualisys with Celesco stringpot

Carriage Speed Results

The repeatability of MASK carriage speed is shown in Figure 42. As the figure indicates, the run-to-run variation in carriage speed is quite small. The uncertainty bars for average speed are computed from the standard deviation from Equation (1). The Type A uncertainty is the only uncertainty that varies from run-to-run. The figure indicates that the uncertainty in the mean value from repeatability is essentially the same as the calculated from a single run. The largest standard deviation in this run series occurred in run 1065. The average velocity in this case is 0.72353 ±0.00022 kts (0.37222 ±0.00012 m/s) or ±0.031 % from the Type A method of evaluation of uncertainty. The Type B uncertainty as evaluated from the uncertainty in wheel diameter and time is not available for this test. In comparison, the uncertainty as computed from repeatability of the test is 0.72363 ±0.00024 kts (0.37226 ±0.00012 m/s) or ±0.034 %. Thus, the uncertainty in a single measurement is within the uncertainty of repeat measurements. Consequently, the small variation of carriage speed is not influencing the repeatability in other measurement results.

Motion Results

The repeatability of the roll, pitch, heave, and axial ramp force are presented in Figures 43 through 50. The variability of the average value and standard deviation is shown in these figures. The average value of all runs is indicated by the solid red line; while the dashed lines indicate the probability at the 95% confidence level for a single run as computed from the inverse Student-*t* times the standard deviation. Uncertainty analysis theory is based upon relatively deterministic processes. This test involves response to waves; consequently, any variation in the results should be considered in the context of probability theory rather than uncertainty analysis. In the following examples, the average value is nominally zero. The quantity of interest is then the standard deviation of the measurement. Establishing the probability of occurrence of the standard deviation would require an assessment of the probability density function of the standard deviation. In the case of the average value, the probability density function is Gaussian from the central limit theorem [8].

LMSR Model Results

The repeatability of the roll angle for the LMSR model is shown in Figure 43. The results for the Rosemont and Qualisys data are quite similar. The standard deviation of the roll angle is slightly lower for the Qualisys data. As the average values indicate, most of the uncertainty is in the repeatability, and the uncertainty bars are smaller than the symbols. The scale has been changed in Figure 43c so that the uncertainty bars are more apparent. The difference in roll angle between the Rosemont and the Qualisys is smaller than the uncertainty in the Rosemount calibration as indicated in Table 10.

The results for pitch in Figure 44 are similar to those for roll. However, the differences in the standard deviation in this case are almost negligible. For the Qualisys data Figure 44c, the uncertainty bars are about the same size as the uncertainty from repeat runs. The average difference in pitch angles, 0.096°, from the two instruments is small in comparison to the uncertainty in the Rosemount pitch calibration.

Heave results are shown in Figure 45. The repeatability and run values of the standard deviation in heave are nearly the same. Both instruments indicate a systematic increase in heave with run number. The average difference, 0.024 in. (0.61 mm) between the two instruments is quite small in comparison to the uncertainty in calibration of the Celesco.

T-Craft Results

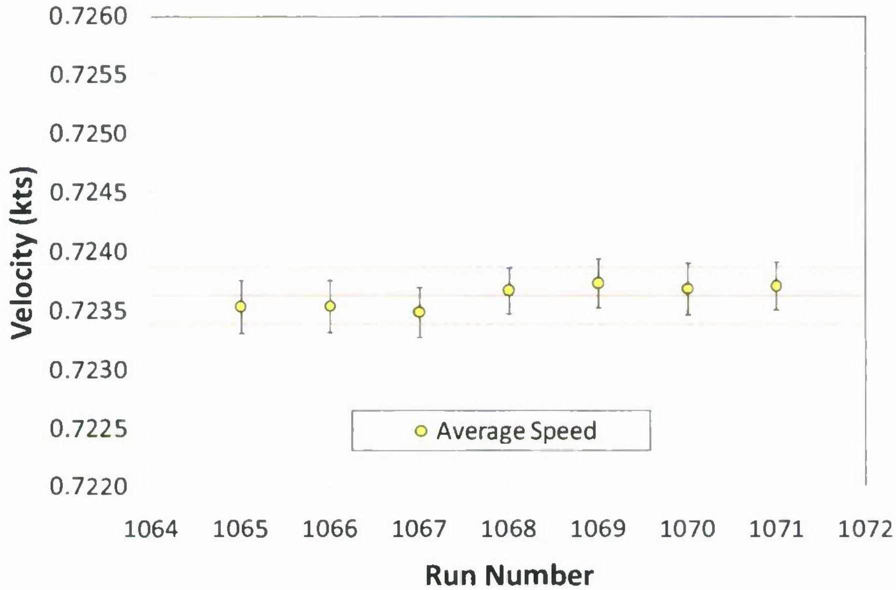
The standard deviation of the roll angle from the Rosemount and Qualisys are quite similar in Figure 46. In comparison to the LMSR, the T-Craft is more sensitive to roll with a nominal standard deviation of about 0.5° in comparison to 0.2° for the LMSR. The uncertainty in repeatability of the average roll angle is similar to the Type A uncertainty for a single measurement. Again, the difference between the two instruments is less than the calibration uncertainty of Rosemount.

In Figure 47, the results for pitch from the Rosemount are similar to those of the Qualisys. The T-Craft is also more sensitive to pitch than the LMSR. The nominal standard deviation in pitch is 0.7° in comparison to 0.1° for the LMSR. The difference in average pitch angle, 0.056°, is small in comparison to the calibration uncertainty of the Rosemount.

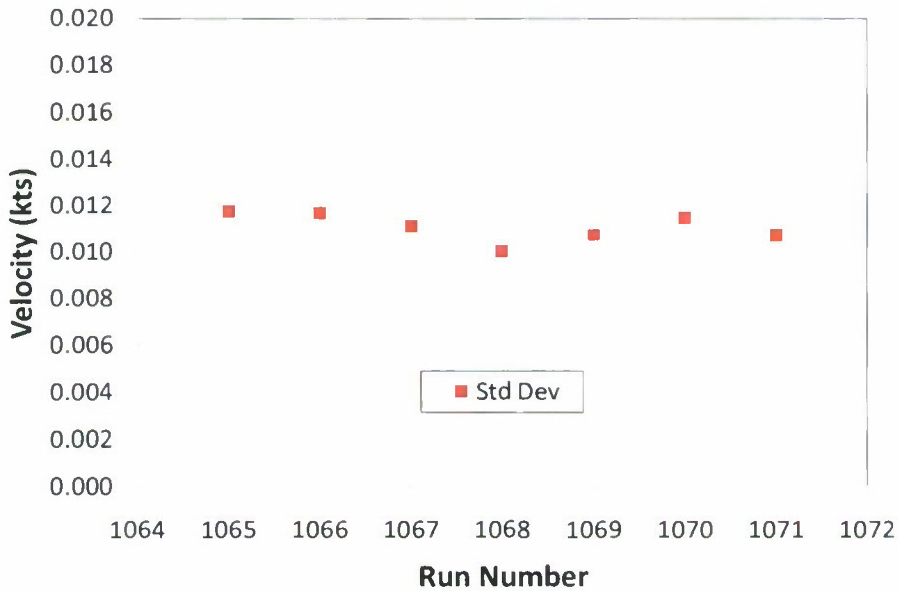
As Figure 48 indicates, the T-Craft is also more sensitive to heave than the LMSR. The nominal standard deviation of heave is 0.3 in. (8 mm) in comparison to 0.15 in. (4 mm) for the LMSR. The repeatability of the results is reasonably consistent.

Axial Ramp Force

The results for axial ramp force are presented in Figure 50 with an example time history in Figure 49. The uncertainty bars for the average values are almost as large as the uncertainty from the repeatability. Howevcr, the standard deviation of the axial force is highly variable with a range of 1.35 to 1.75 lbf or a difference of 22 %. The original calibration data for the test were in lbm not lbf, but the difference has a negligible effect on these results. As indicated previously, the difference in lbm and lbf is 0.058% in the MASK.

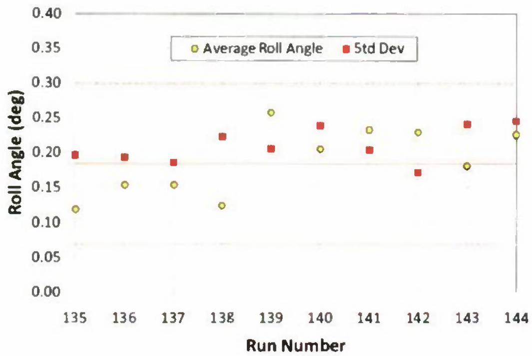


a. Average carriage speed

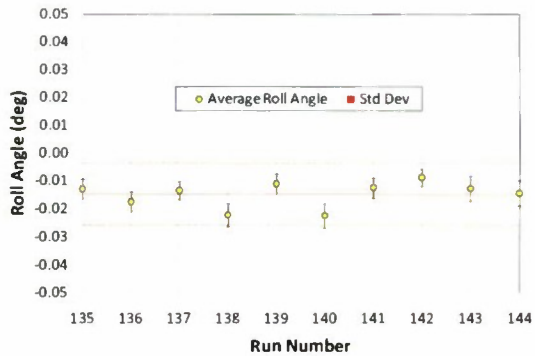


a. Standard deviation of carriage speed

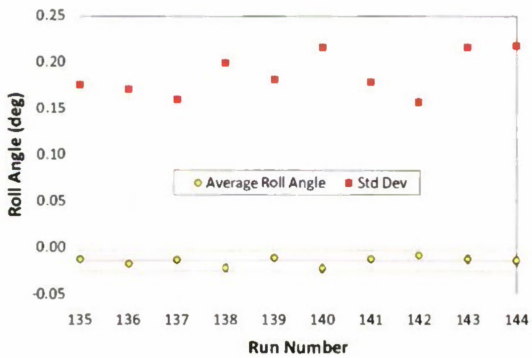
Figure 42. Repeatability of carriage speed



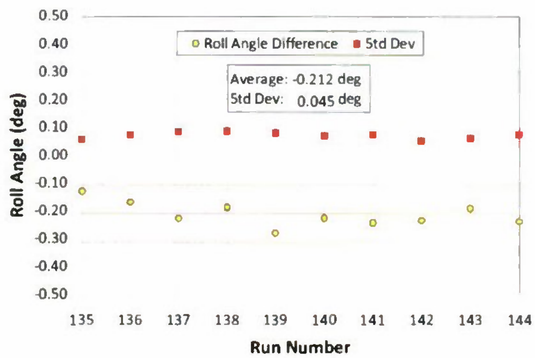
a. Rosemount data



c. Qualisys averages

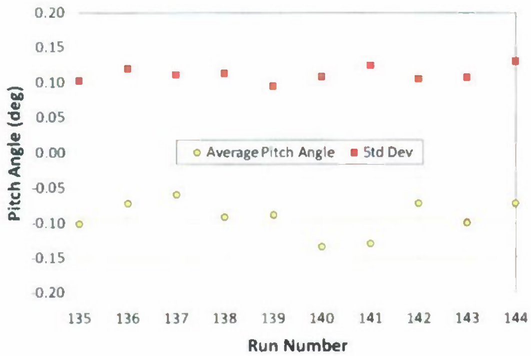


b. Qualisys data

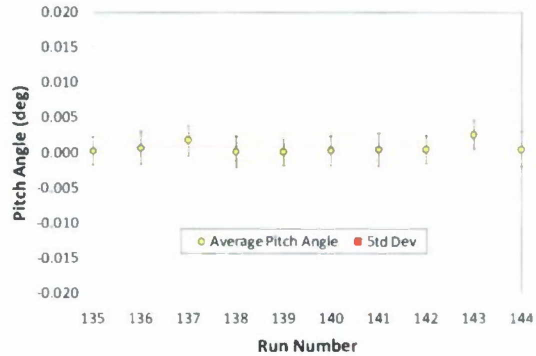


d. Difference between Rosemount & Qualisys

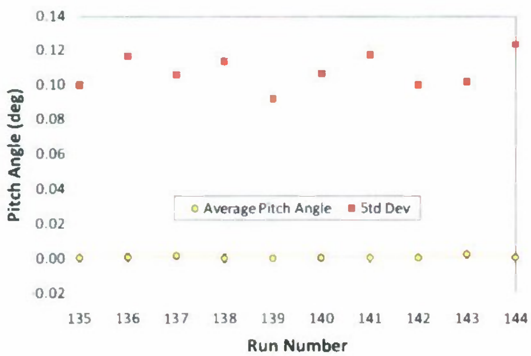
Figure 43. Roll angle repeatability for the LMSR (DTMB model 5494)



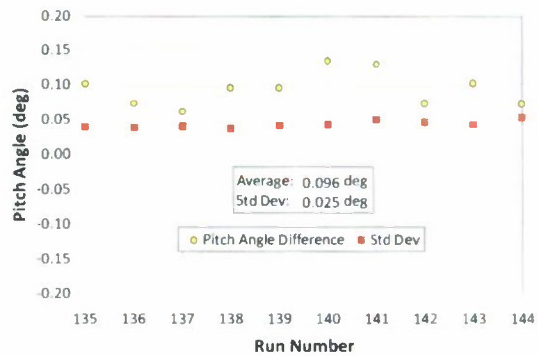
a. Rosemount data



c. Qualisys averages

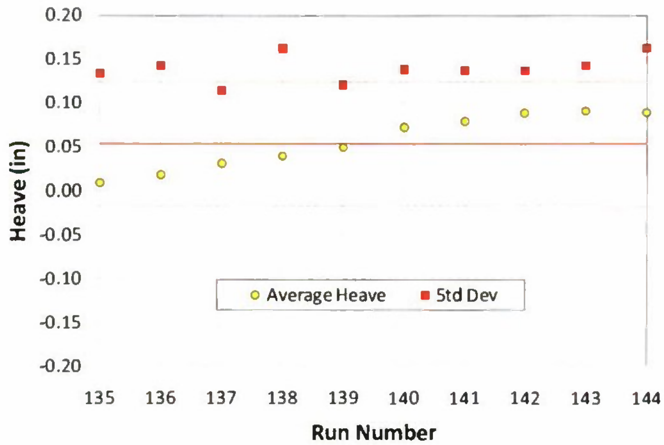


b. Qualisys data

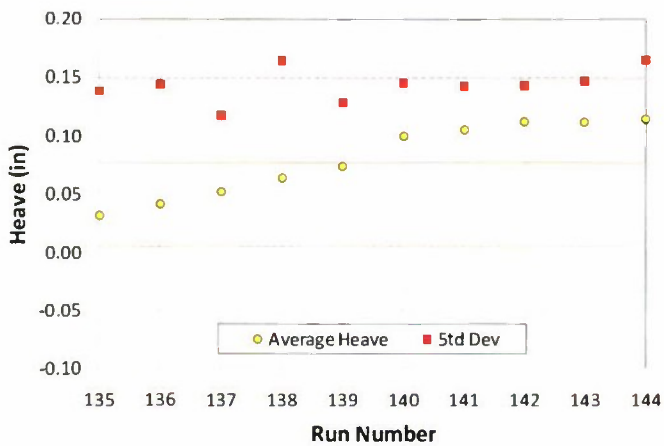


d. Difference between Rosemount & Qualisys

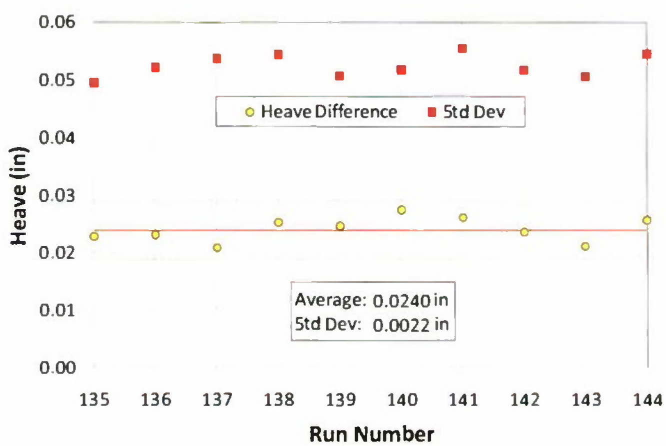
Figure 44. Pitch angle repeatability for DTMB model 5494



a. Celesco data

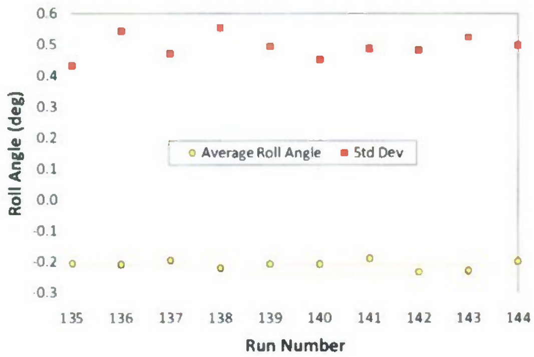


b. Qualisys data

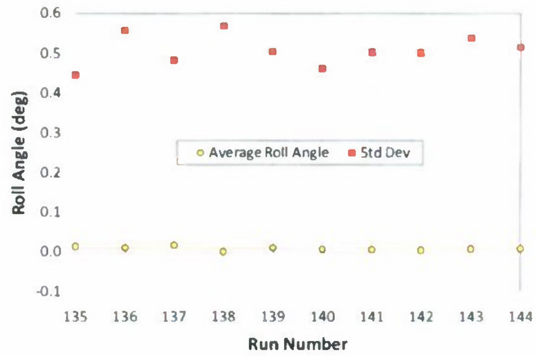


c. Difference between Celesco & Qualisys

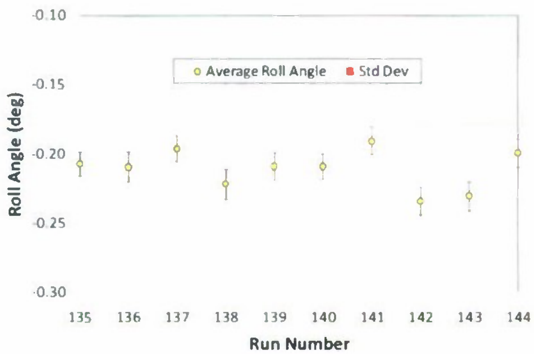
Figure 45. Heave repeatability for DTMB model 5494



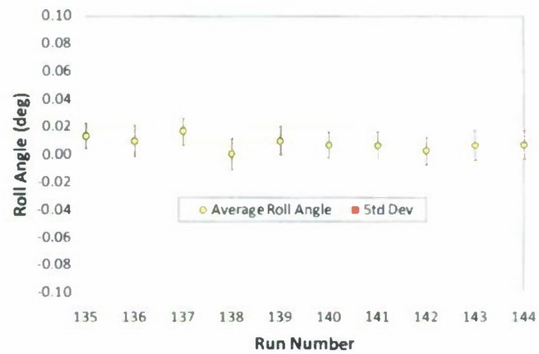
a. Rosemount data



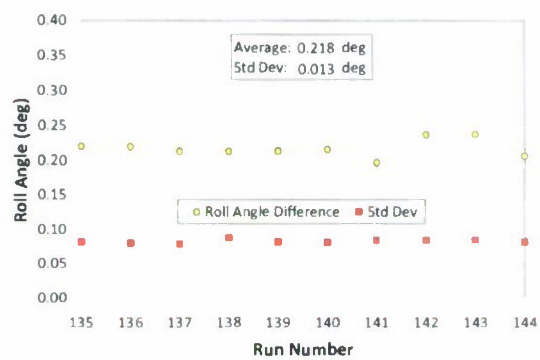
c. Qualisys data



b. Rosemount averages

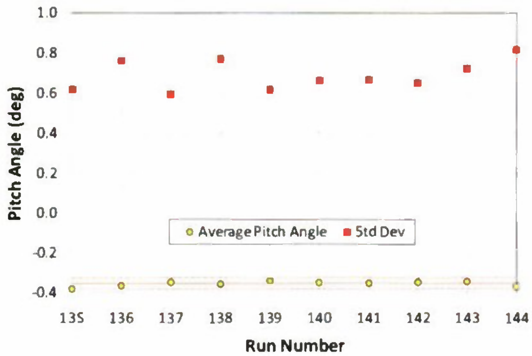


d. Qualisys averages

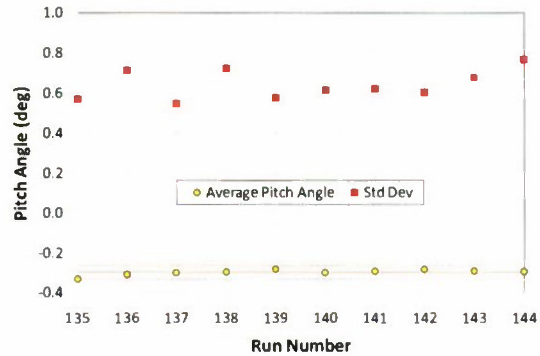


e. Difference between Rosemount & Qualisys

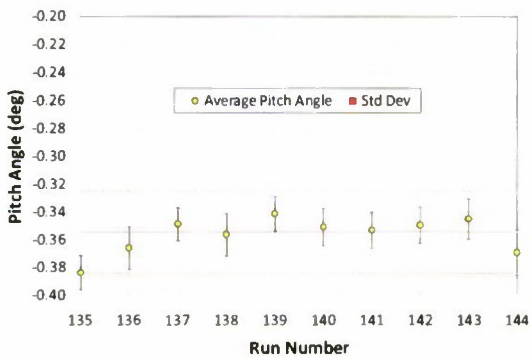
Figure 46. Roll angle repeatability for DTMB model 5687



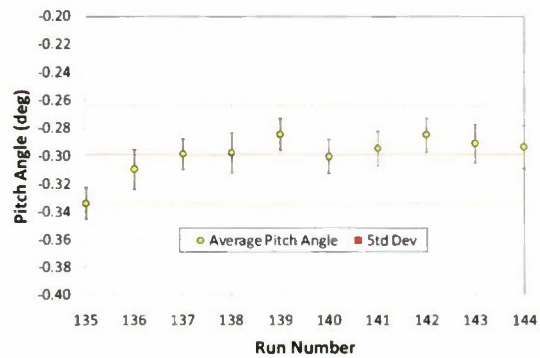
a. Rosemount data



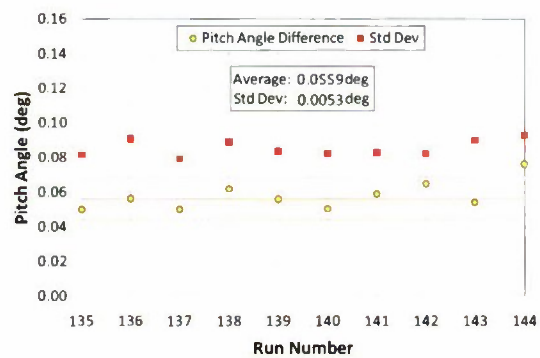
c. Qualisys data



b. Rosemount averages



d. Qualisys averages



e. Difference between Rosemount & Qualisys

Figure 47. Pitch angle repeatability for DTMB model 5687

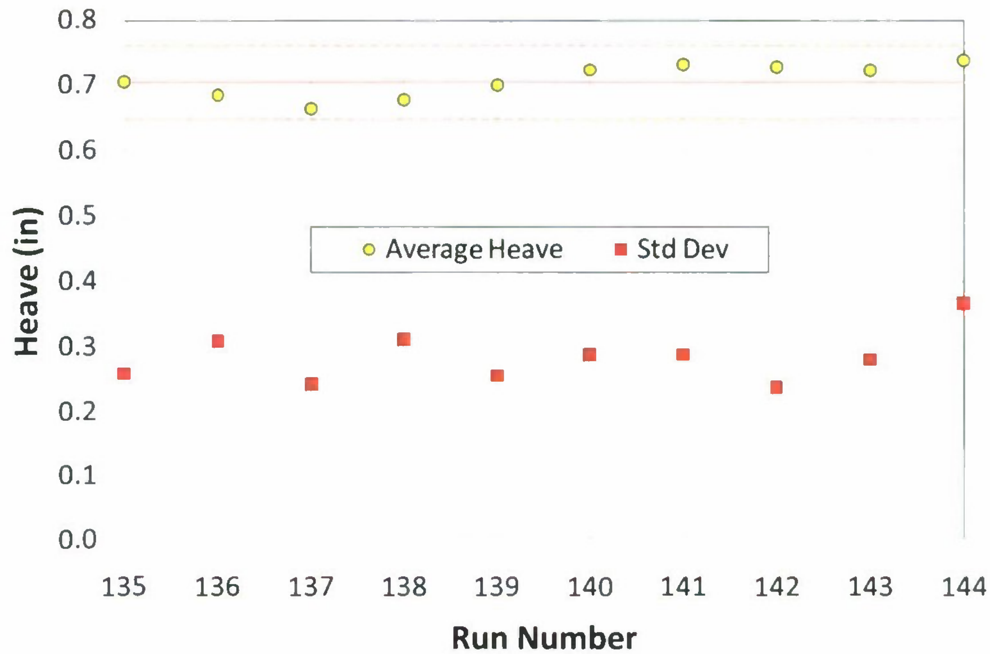


Figure 48. Heave repeatability for DTMB model 5687

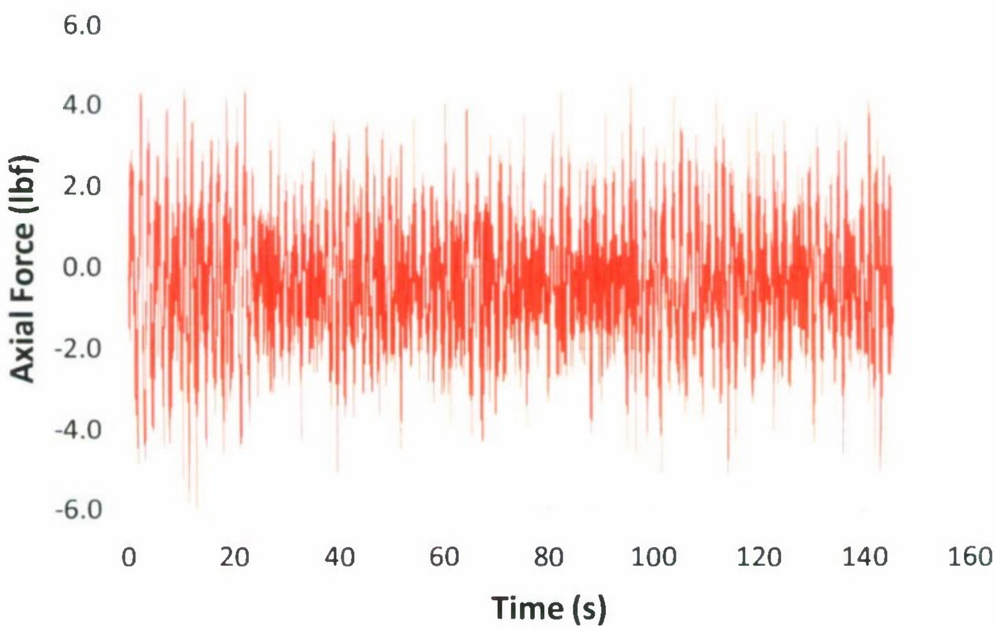
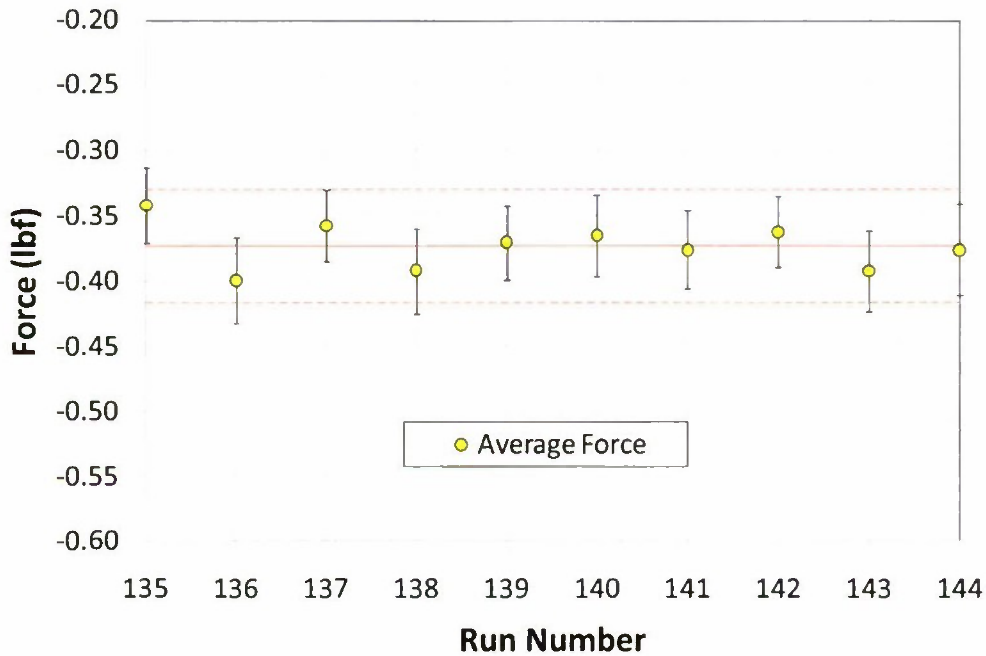
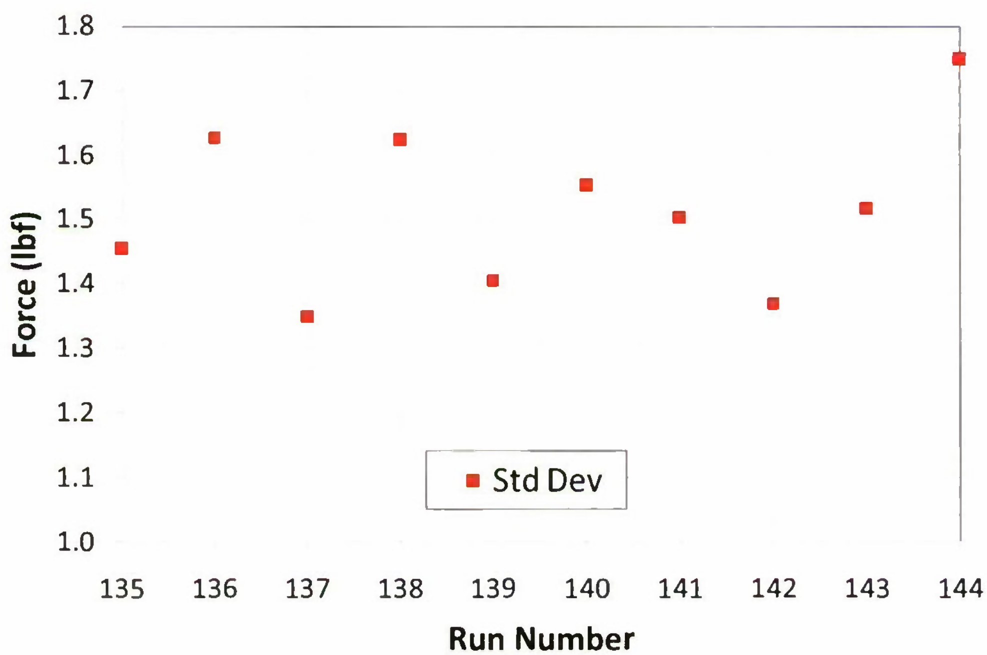


Figure 49. Time history of axial ramp force for Run 135



a. Average force



b. Standard deviation

Figure 50. Repeatability of total axial ramp force

RESPONSE TIME HISTORY DATA

Data Reduction

Except for the Nano load cell, time histories of all data channels were collected by an HBM computer system at 100 samples per second. Data from the Nano load cell was collected by a LabView data collection program running on a laptop computer at 100 samples per second. During the test, the collected data were filtered using a Butterworth 20 Hz filter. Post-test processing of the HBM data required applying a low pass filter (5 Hz) to all channels except wave height channels 3, 6, and 7. The filtering that was applied had 100% pass for all data lower than 5 Hz, and 0% pass for all higher than 10 Hz and a graduated pass from 100 to 0% between 5 and 10 Hz. Filtering was required in order to remove a high frequency vibration recorded on T-Craft accelerometers and ramp load cells. The high frequency vibration was induced by T-Craft's two cushion inflation fans running at over 4,000 rpm. Three wave height channels (3, 6, and 7) were not processed due to frequent data dropouts making them unable to be remediated. It is left to the end user to inspect and process the wave height data if required. The data from the Nano was processed and available to be used for further analysis. The South and West Wave Height channels (channels 4 and 5) were processed removing relatively few data dropouts and a small non-zero mean value offset. Next, the first 49 and last 50 data points were removed from all channels to eliminate end effects from the filtering process.

Response data from test runs are presented on a DVD disk. The data on the DVD are presented in English model scale units. The linear scale factor is 30.209. In addition to ASCII time history files (file extension .dat), the data DVD contains strip chart plots (file extension .png) and a spectral analysis plot of the time histories for all channels. A statistic text file is also given that presents minimum analysis statistics for each processed test run. Mean value offsets (due to gage residuals and installation bias) have not been removed from any data channels except for the two wave height channels (West & South) as stated previously. Calm water zero speed data runs for the T-Craft were taken throughout the test. Care should be taken in choosing a calm water zero run to use as a tare since, for instance, the effects of the bow down pitch attitude (caused by attaching the stern ramp to the T-Craft or loading the ramp with a tank) could be lost if the wrong tare run were applied to the data.

Ramp Loads Data

The objective of this test was to measure the loads on the pin connections of two ships making up a seabase with a ramp between them. The executed test matrix consisted of three different configurations of the seabase, four different loading conditions for the T-Craft model, six different random wave conditions, three headings and two speeds. Because of the large amount of data collected, it was decided to concentrate analysis of the ramp loads on Sea State 3/7.5 seconds, Sea State 3/7.5 & 15 seconds and Sea State 4/11.3 seconds.

First, the loads on the pin connections of the different T-Craft loading conditions for each seabase configuration were compared and shown in Figure 51. The only forces included in the analysis were the port side longitudinal forces of the LMSR ramp connection point. The port side would encounter wave action first as headings were changed. Also, because the vertical and transverse forces were small compared to the longitudinal forces they were not included in this analysis. The data gathered from the port side are the same as for the starboard side, but opposite in direction. The longitudinal forces observed at the LMSR connection point were higher (almost double) than the T-Craft end. This is due to the fact that the LMSR was fixed at the carriage (via pogo stick) and only free to pitch, roll and heave. From this configuration, the ramp and T-Craft act as a long cantilever arm and large mass creating a moment about the LMSR end connection. Each of the loads is displayed as full-scale single significant amplitudes in tons force.

As shown in Figure 51, the Tandem configuration had little difference in the axial force between the Sea State 3 and Sea State 3 bi-modal seaways and the force was slightly higher with the fully loaded T-Craft. As expected, the Sea State 4 waves produced significantly larger loads on the ramp pin connections. For the Hinged seabase configuration, the axial force was significantly smaller than both the Tandem and Side-by-Side configurations, but the bi-modal Sea State 3 had larger forces than the unimodal Sea State 3. This suggests that there was some roll excitation of the LMSR causing the increased loads due to the longer wave periods in that seaway. For the Side-by-Side configuration, the axial force loads were much more influenced by the seaway. The Sea State 3 waves produced the lowest forces, followed next by the Sea State 3 bi-modal

seaway, and lastly Sea State 4 produced the largest forces. There are possibly two reasons for the difference in the axial force produced by each of the two Sea State 3 conditions. One could be that the longer period waves are not reflected by the LMSR hull but pass through it and excite the T-Craft model which, in turn, increases the axial loads on the ramp pins. The other possibility is that since the longer modal period waves from the bi-modal spectrum, 15 seconds, are much closer to the resonant roll period of the LMSR, 18.9 seconds, the LMSR could experience more roll motion and therefore causing more axial force. What is probably happening is a combination of the two phenomena; more roll motion from the LMSR and more wave energy getting to the T-Craft model.

The effect of loading on the T-Craft and ramp can also be discerned from Figure 51. For the Tandem configuration, it appears that there is a slight increase in the axial loads when the T-Craft model is loaded with the four tanks, but there is no significant difference in the axial ramp loads with the tank on the ramp. The longitudinal force for the Hinged configuration was similar to the Tandem configuration but the difference in the loading had less of an effect. Finally, there was no effect on the ramp pin longitudinal force for the Side-by-Side configuration due to the variation in the loading conditions of the T-Craft or ramp.

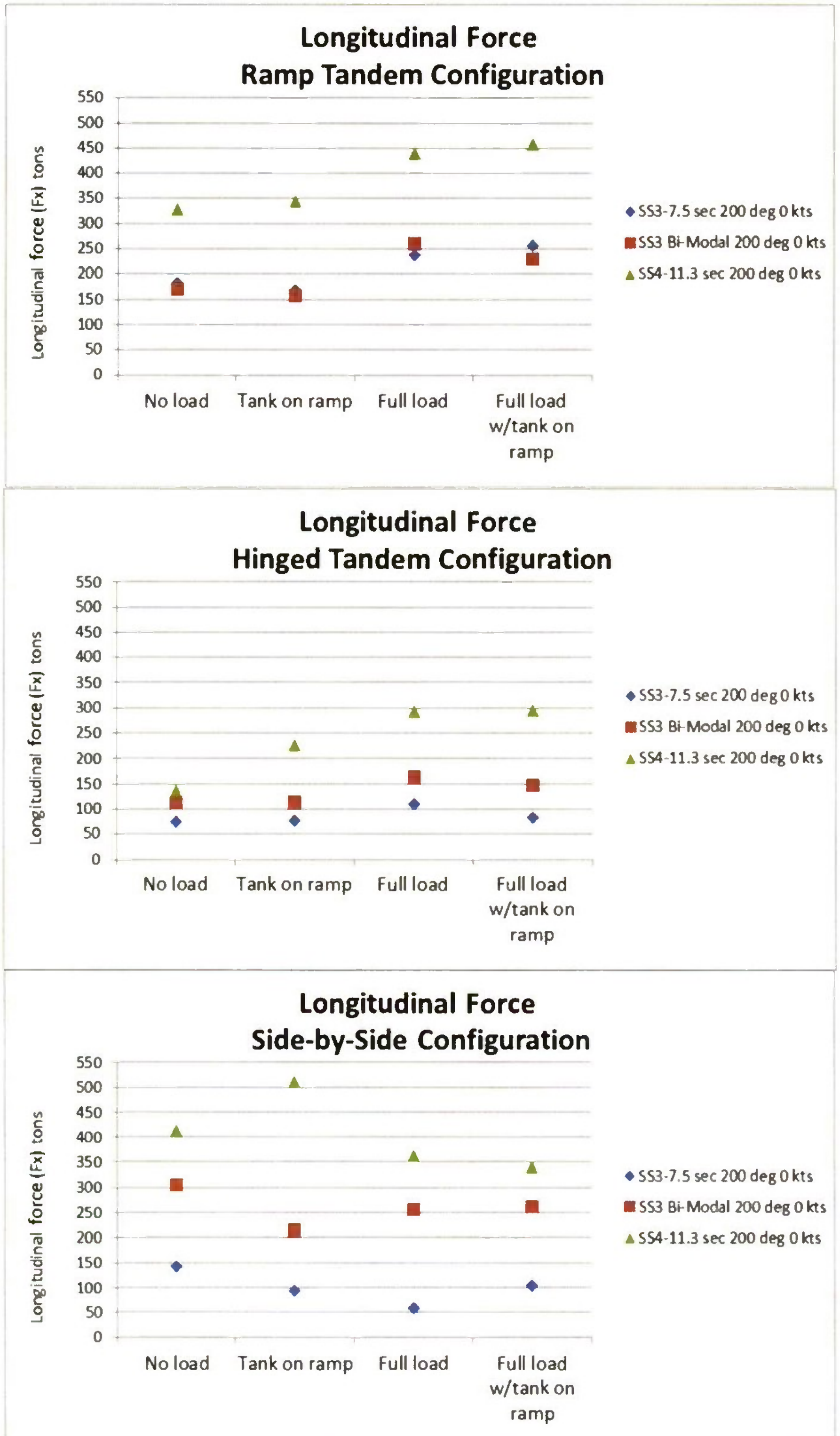


Figure 51. Comparison of Longitudinal Forces on Ramp Pin Connection at the LMSR side over T-Craft Load Conditions, Seabase Configurations, and Seaway

Next, the influence of heading on the pin loads was investigated for the three seaways and three seabase configurations. For this set of conditions, the T-Craft was unloaded with a tank load on the ramp. The location of the force in this comparison was also on the port side of both the LMSR and T-Craft ramp connection points.

For each sea base configuration, longitudinal forces at the ramp connection points increased as sea conditions and headings increased. In Sea State 3/7.5 seconds sea condition, the longitudinal forces in Tandem configuration were greater than the other configurations, as the heading increased. In the Hinged configuration, longitudinal forces were lower in each heading and sea condition when compared to other configurations. The wave encounters in Hinged configuration had a minimum affect because the T-Craft was directly attached to the LMSR.

For the Side-by-Side sea base configuration, the longitudinal forces at the LMSR connection points were lower at zero knots as the headings increased toward bow seas for Sea State 3/7.5 & 15 second and Sea State 3/7.5 seconds modal period. The forces were higher as speed was increased to four knots. In Sea State 4/11.3 seconds longitudinal forces were much higher at both zero and four knots, since the wave energy was greater at this sea condition.

Figures 52 through 54 show the single significant amplitude force data (heading vs. longitudinal force) for the port side at Sea State 3/7.5 seconds, Sea State 3/7.5 & 15 seconds and Sea State 4/11.3 seconds. Comparing the data, it can be concluded that the magnitude of the ramp pin forces increased as both the sea conditions and heading became greater. The change in speed (0 knots and 4 knots) and tank loads had less influence than sea state and heading. In addition, the configurations mostly affected by this were the Tandem and Side-by-Side with the models separated by the ramp. Both configurations effectively create a long lever arm with the T-Craft at a standoff from the LMSR stern generating the high forces that were recorded during the test. In low and bi-modal Sea State 3 the magnitudes of the force were fairly close in the Tandem and Side-by-Side configurations. However there was larger difference between the two configurations in Sea State 4/11.3. It is worth mentioning that the LMSR is fixed at the 'pogo stick' and it is towing the T-Craft in all sea conditions. This creates a drag force which also contributes to the high forces at the LMSR connection points.

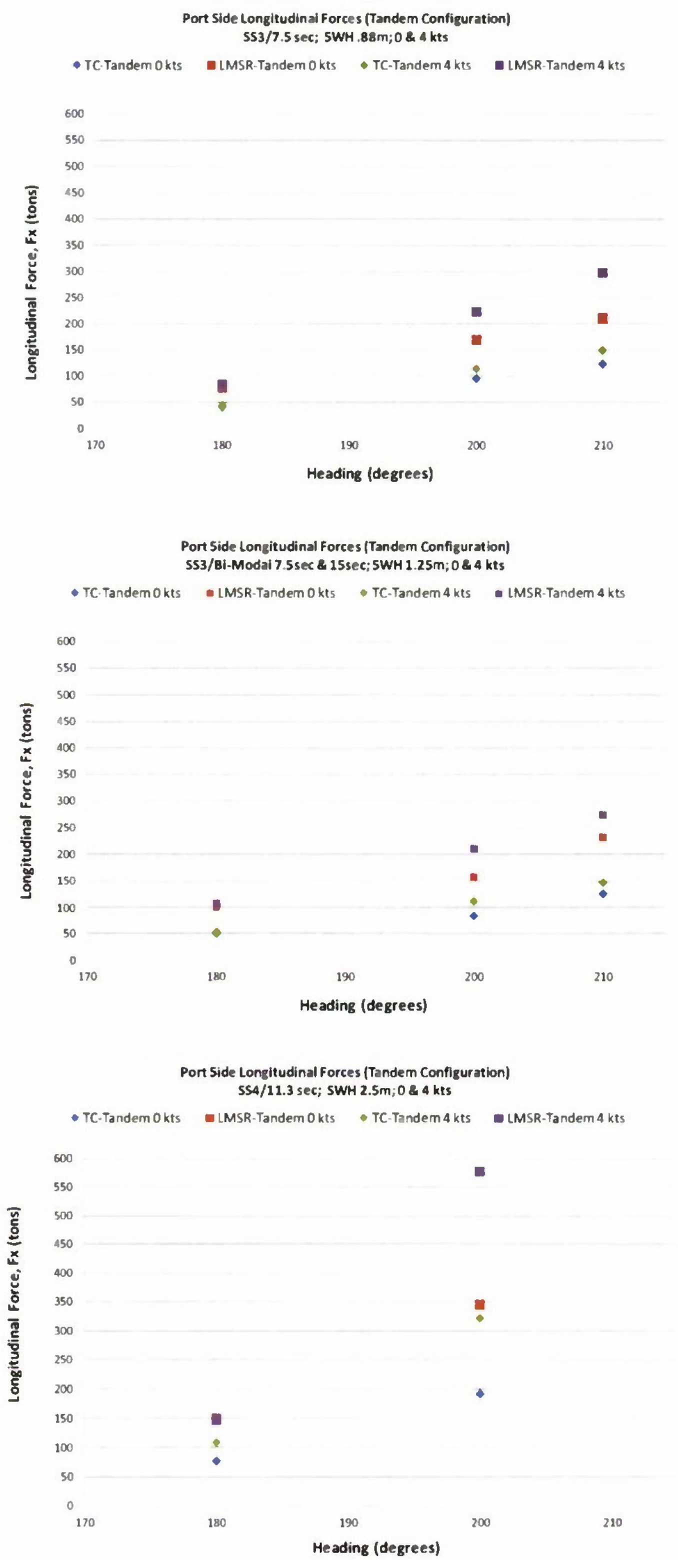
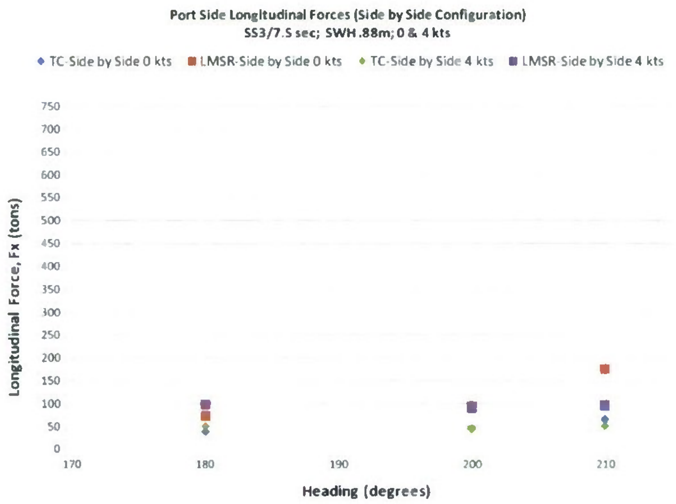
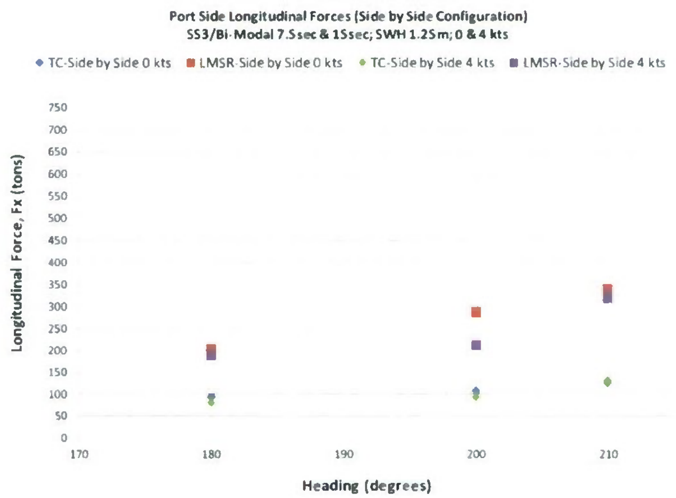


Figure 52. Tandem configuration longitudinal forces for Sea State 3/7.5, 7.5 & 15 seconds, Sea State 4/11.3 seconds modal period, respectively





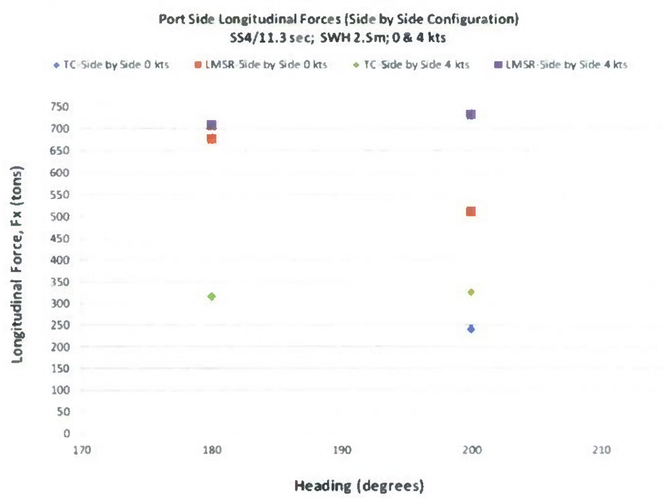
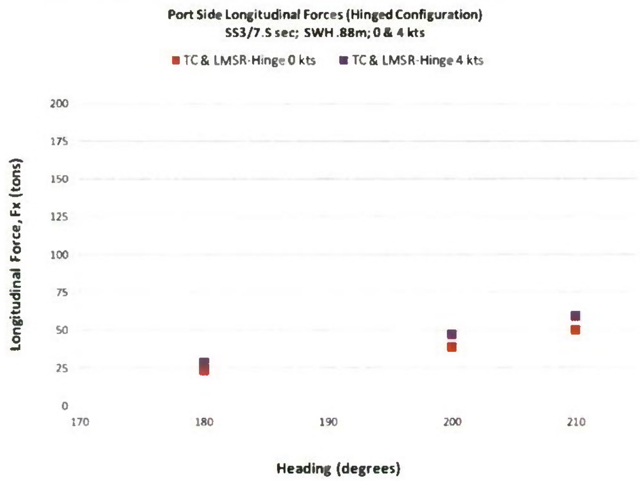
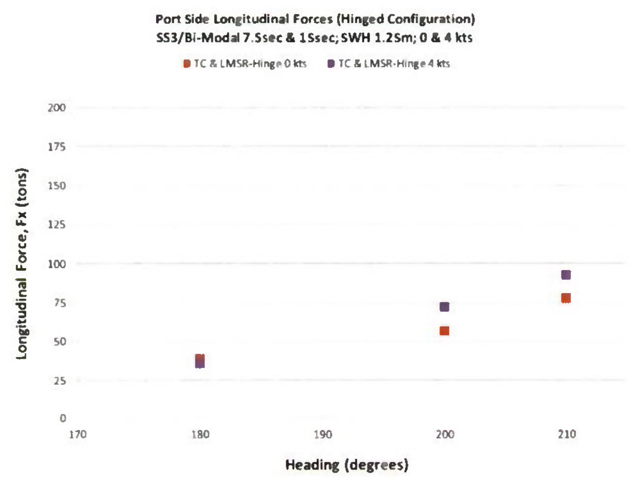


Figure 53. Side-by-side configuration longitudinal forces for Sea State 3/7.5, 7.5 & 15 seconds, Sea State 4/11.3 seconds modal period, respectively





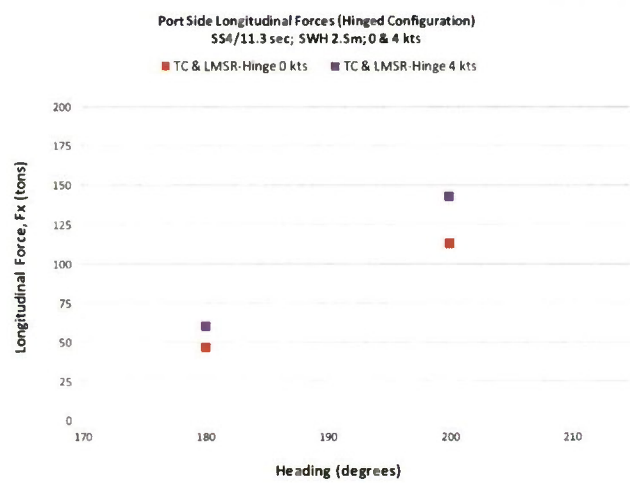


Figure 54. Hinged configuration longitudinal forces for Sea State 3/7.5, 7.5 & 15 seconds, Sea State 4/11.3 seconds modal period, respectively

Regular Wave Data

Regular wave response data was collected for waves whose full-scale frequencies ranged from 0.5 to 1.3 radians per second. Wave height varied across frequencies to maintain a constant wave slope target of 1/120. T-Craft and LMSR pitch, roll, and heave Response Amplitude Operators (RAO's) for the Tandem Ramp Test Configuration have been calculated for the port bow relative wave heading (200 degrees) at 0 and 4 knots ship speed. The roll and pitch response operators have been non-dimensionalized by wave slope while the heave response operator was non-dimensionalized by wave height. Data recorded from the West Wave Height sonic were used to derive the Response Amplitude Operators (RAOs) since this sonic was located in front of the seabase and offered an unobstructed view of the incident waves. All other sonic devices were located close to the seabase and measured either attenuated or reflected wave data due to the presence of the seabase models. Figures 55 and 56 show RAO's for the T-Craft in the Tandem Ramp Test Configuration (on cushion) at ship speeds of 0 and 4 knots and LMSR models in port bow regular waves (200 degree relative wave heading) at ship speeds of 0 and 4 knots, respectively. Figure 57 shows the RAO's for the T-Craft in the Tandem Ramp Barge Test Configuration in port bow regular waves (200 degree relative wave heading) at ship speeds of 0 and 4 knots.

Looking at these three figures, some general conclusions can be drawn with respect to the RAOs of the T-Craft and LMSR. First, there does not appear to be much difference in the T-Craft RAOs with respect to the change in speed but there are larger RAO amplitudes for the LMSR at 4 knots than 0 knots for the lower frequencies. Second, as expected, the T-Craft RAOs are significantly larger than the LMSR for the same conditions. Third, there appears to be little difference in the RAOs comparing the T-Craft on cushion and as a barge with a Styrofoam block fitted between the hulls for the zero speed case. This is probably due to the fact that there was very little leakage of air from the bow and stern seals at zero speed of the T-Craft as a SES. However, at four knots, the T-Craft as a barge has higher pitch and heave RAO amplitudes than as an SES. This could be a function of leakage from the SES air cushion when at speed causing increased damping.

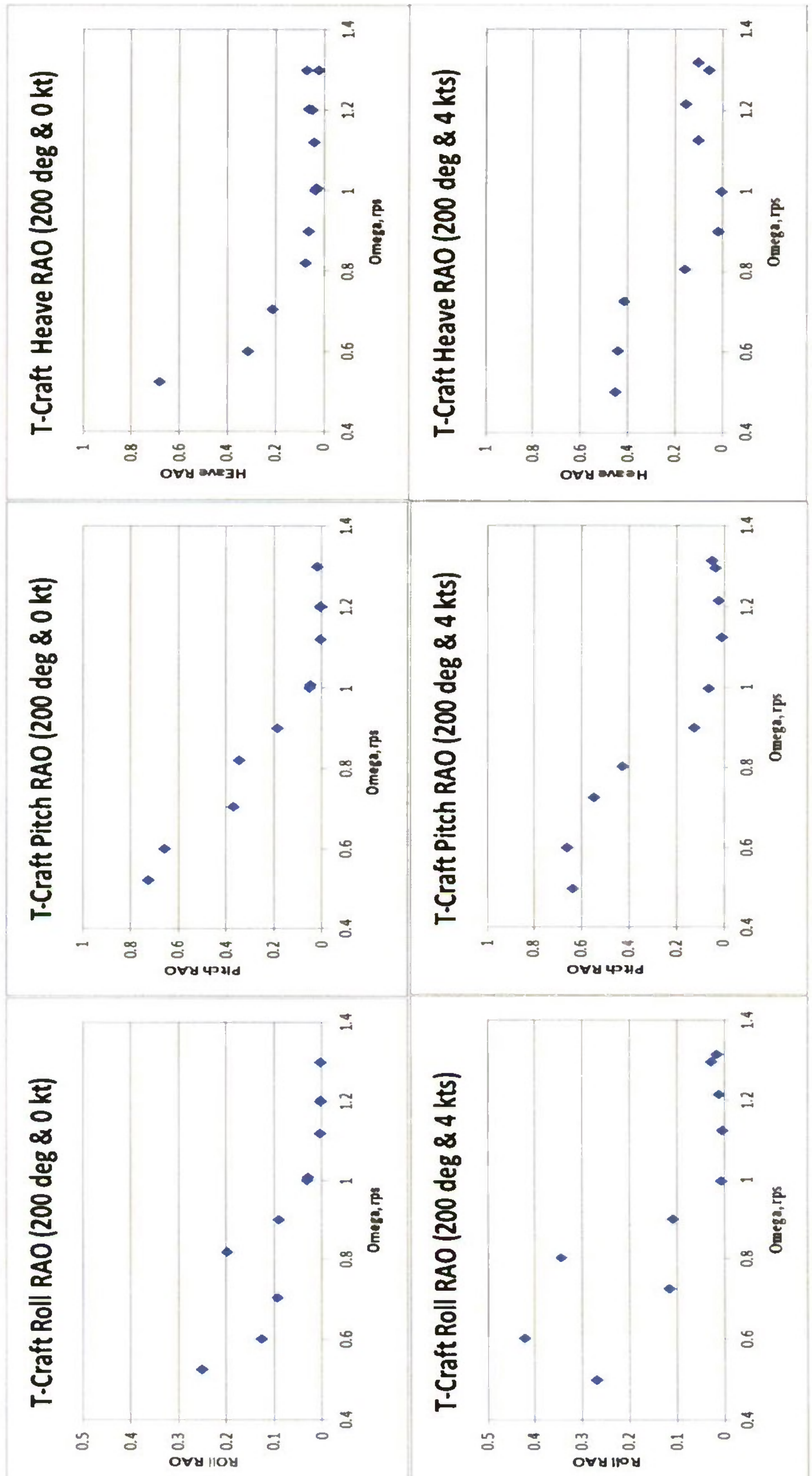


Figure 55. T-Craft motion response RAO's for roll, pitch, and heave in port bow waves (200 deg) at 0 and 4 knots speed

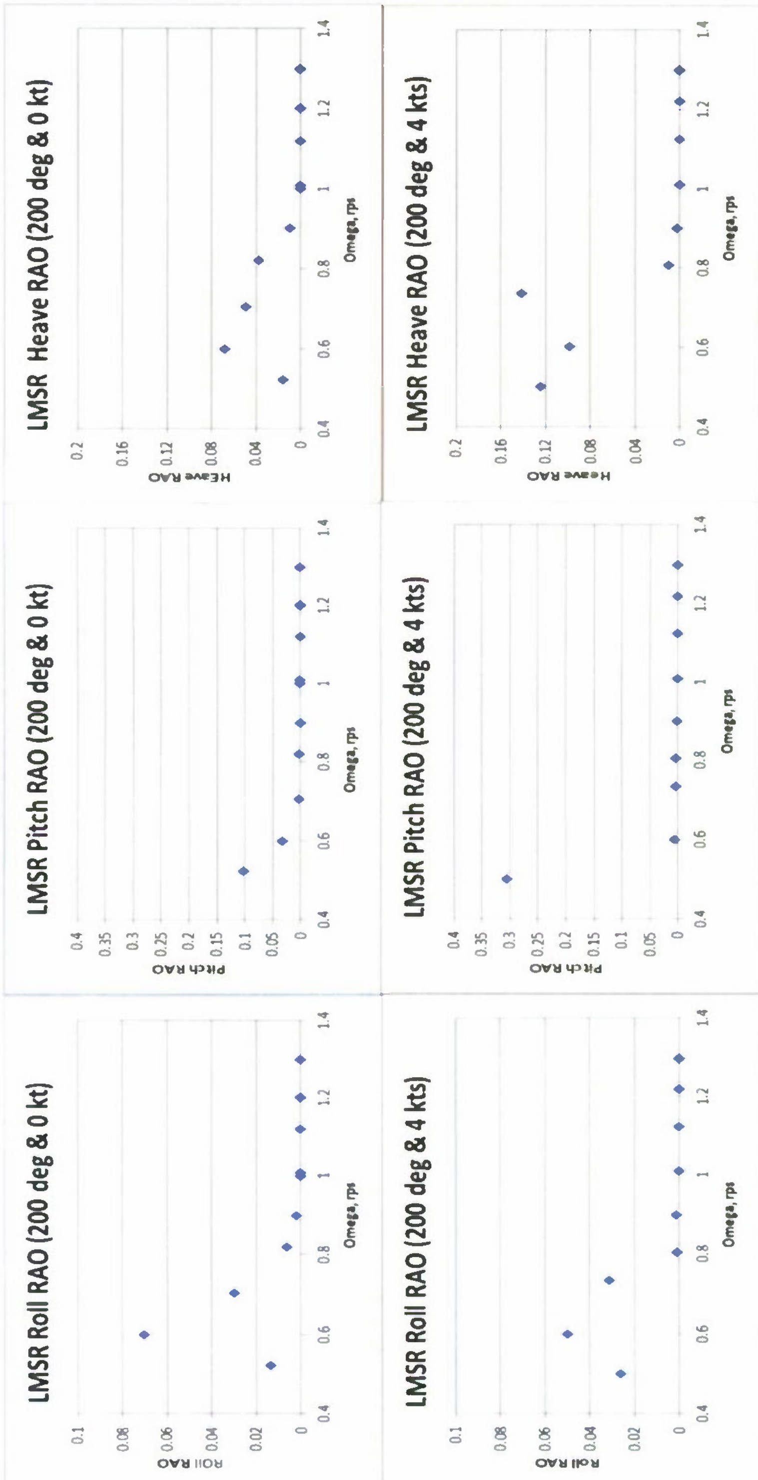


Figure 56. LMSR motion response RAO's for roll, pitch, and heave in port bow waves (200 deg) at 0 and 4 knots speed

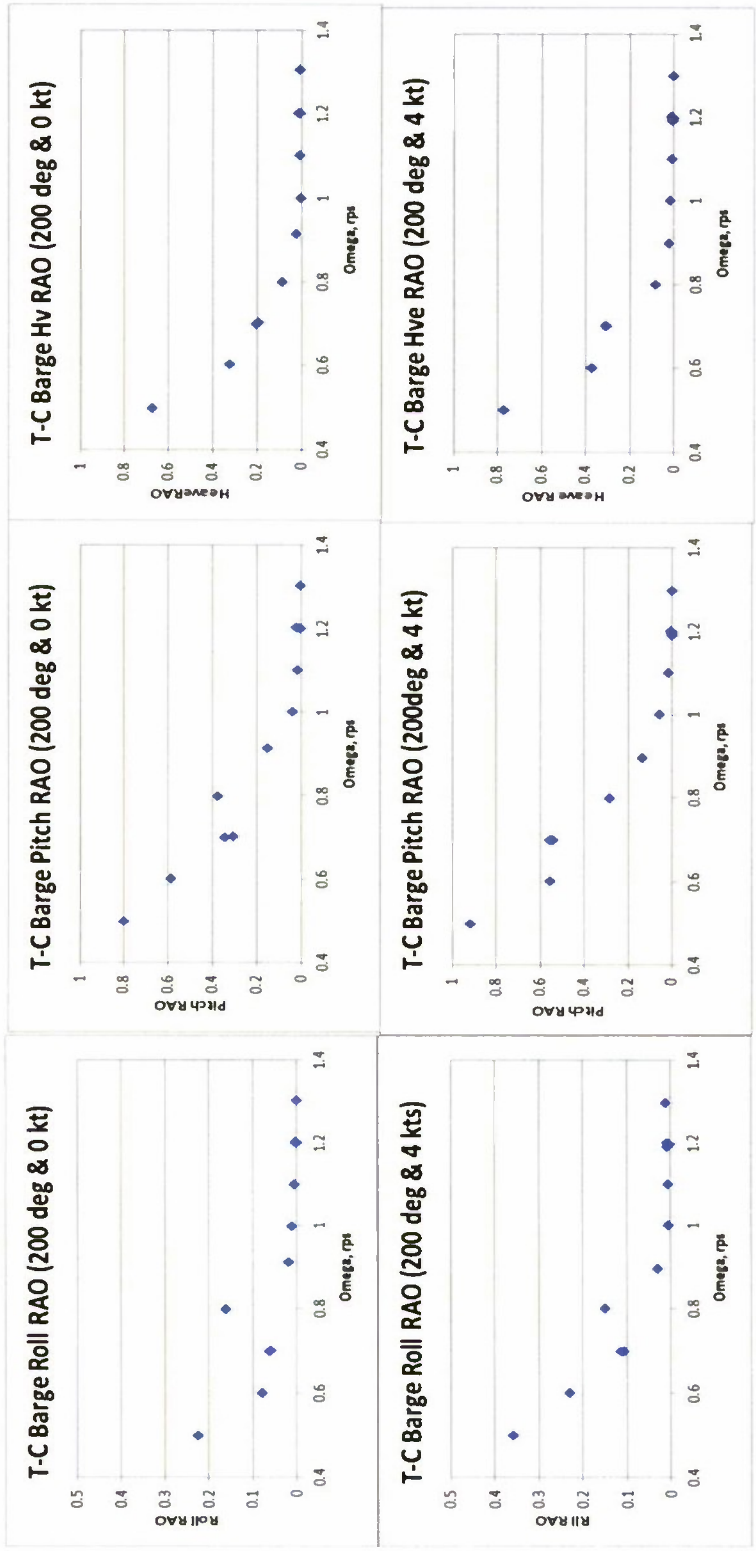


Figure 57. T-Craft (Barge) motion response RAO's for roll, pitch, and heave in port bow waves (200 deg) at 0 and 4 knots

Random Wave Data

Motion data for the irregular wave tests was collected for an equivalent full-scale time of 30 minutes exposure to waves. Motion data from duplicate runs (at four knots ship speed) were concatenated (using the equations shown in Appendix D) in order to attain the desired number of wave encounters for the at-speed test conditions. The following figures show the motions of the T-Craft and LMSR with the no load condition and compare the motions from this test with those from the earlier 2008 test. Figures 58 and 59 are plots of single significant amplitude (SSA) motions of the T-Craft and LMSR in the Tandem configuration for heave, pitch, and roll. The plots show motions for the LMSR and T-Craft vessels in Sea States 3 & 4 versus modal wave period for headings of 180 and 200 degrees at zero knot ship speed. Figures 60 and 61 present LMSR and T-Craft motions in Sea States 3 & 4 - versus modal wave period - for headings of 180 and 200 degrees at 4 knots ship speed. Figures 62 and 63 depict the LMSR and T-Craft significant single amplitude pitch, roll, and heave motions versus relative wave heading in Sea State 3 waves at zero and 4 knots ship speed. Finally, Figures 64 and 65 show the significant single amplitude LMSR and T-Craft motions versus relative wave heading in Sea State 4 waves at zero and 4 knots ship speed, respectively.

Motion data from the 2008 T-Craft model test (displayed as hollow data points) also appear on the figures for comparison purposes. For the most part, environmental conditions were similar between tests. Sea State 3 at the 10-second modal period was the exception. Sea State 3, 10-second waves in this test were almost twice the height of the 2008 test [1]. This is reflected in the plotted SSA motion data. In addition, the ramp foot was different in the 2008 test. The ramp foot in the current experiment was fixed to the T-Craft deck permitting the ramp freedom to pitch only whereas the ramp foot in the 2008 test allowed the ramp foot freedom to surge, roll, and pitch on a sliding gimbal.

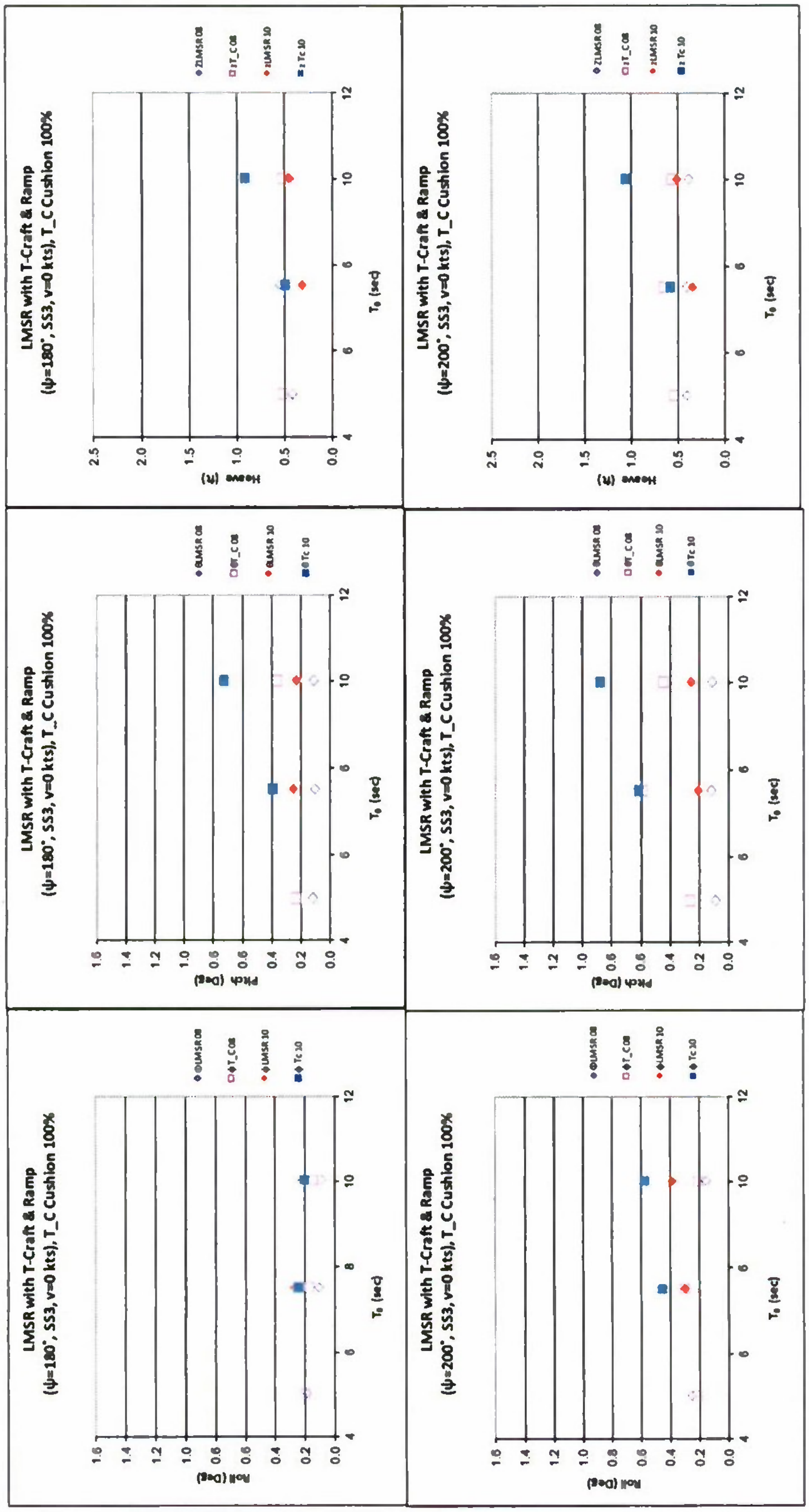


Figure 58. Significant Single Amplitude motions versus modal wave period for the T-Craft and LMSR Tandem configuration with ramp in Sea State 3 head and port bow waves (7.5 Second Modal Period) at 0 knots

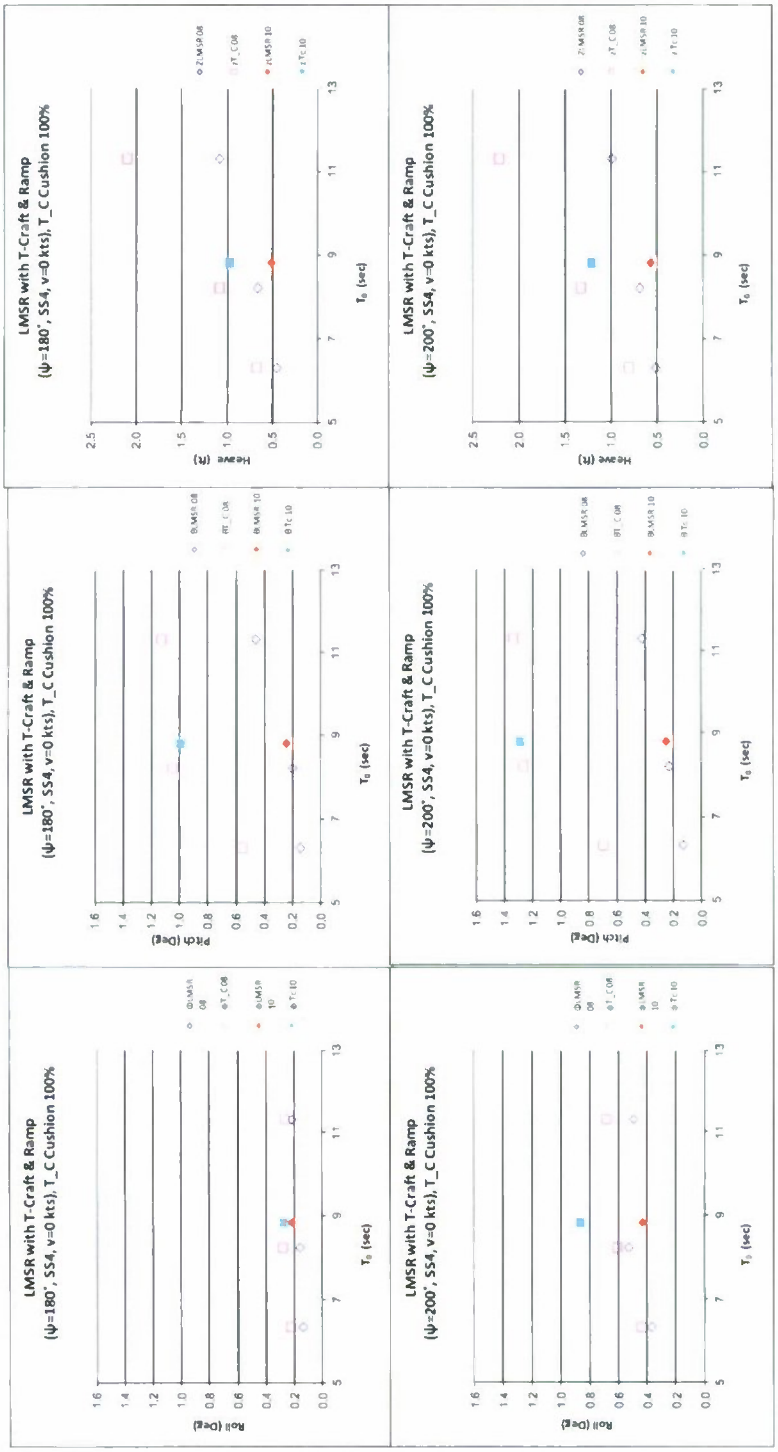


Figure 59. Significant Single Amplitude motions versus modal wave period for the T-Craft and LMSR Tandem configuration with ramp in Sea State 4 head and port bow waves (8.8 Second Modal Period) at 0 knots

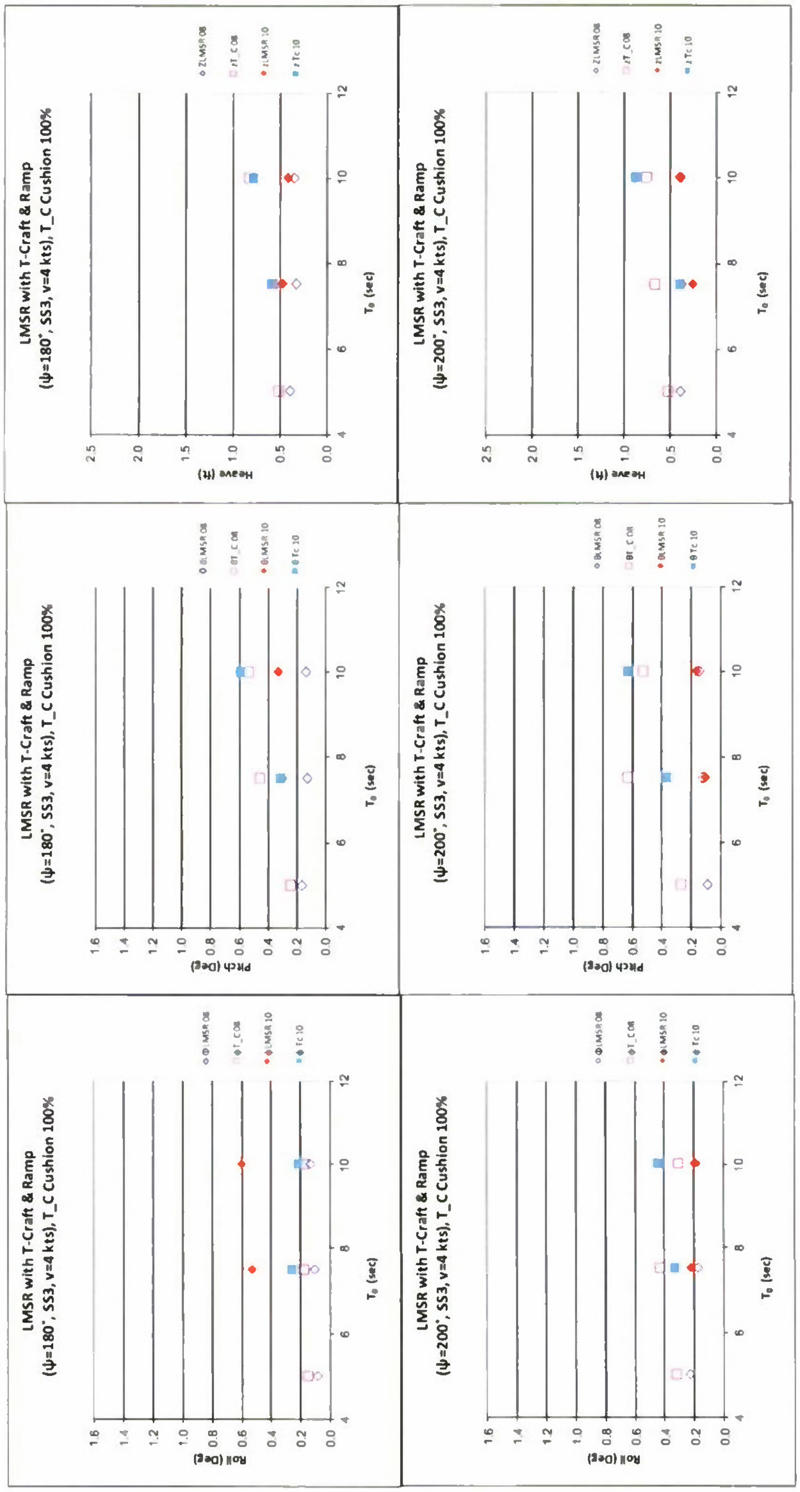


Figure 60. Significant Single Amplitude motions versus modal wave period for the T-Craft and LMSR Tandem configuration with ramp in Sea State 3 head and port bow waves (8.8 Second Modal Period) at 4 knots

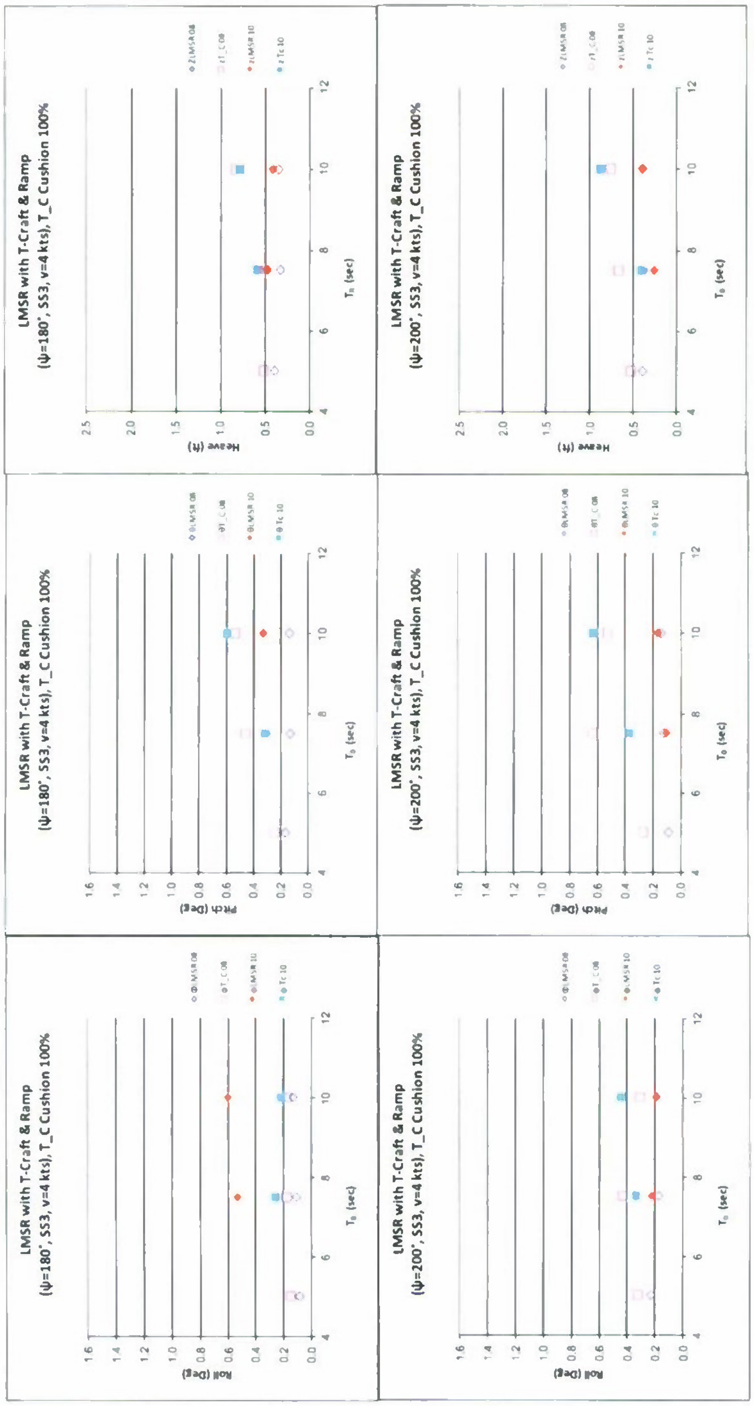


Figure 61. Significant Single Amplitude motions versus modal wave period for the T-Craft and LMSR Tandem configuration with ramp in Sea State 4 head and port bow waves (8.8 Second Modal Period) at 4 knots

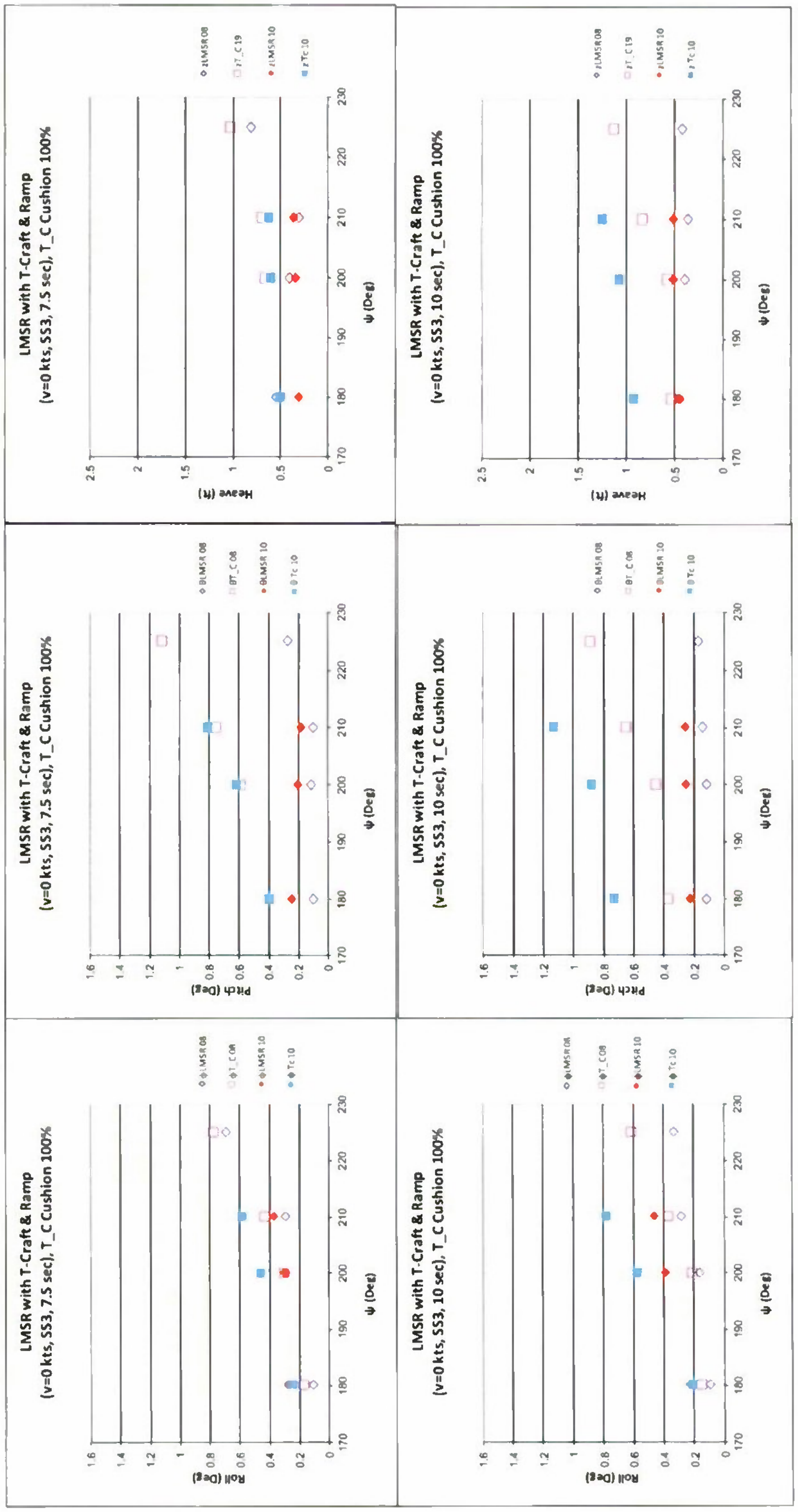


Figure 62. Significant Single Amplitude motions versus relative wave heading for the T-Craft and LMSR Tandem with ramp in Sea State 3 waves (7.5 & 10 Second Modal Period) at 0 knots

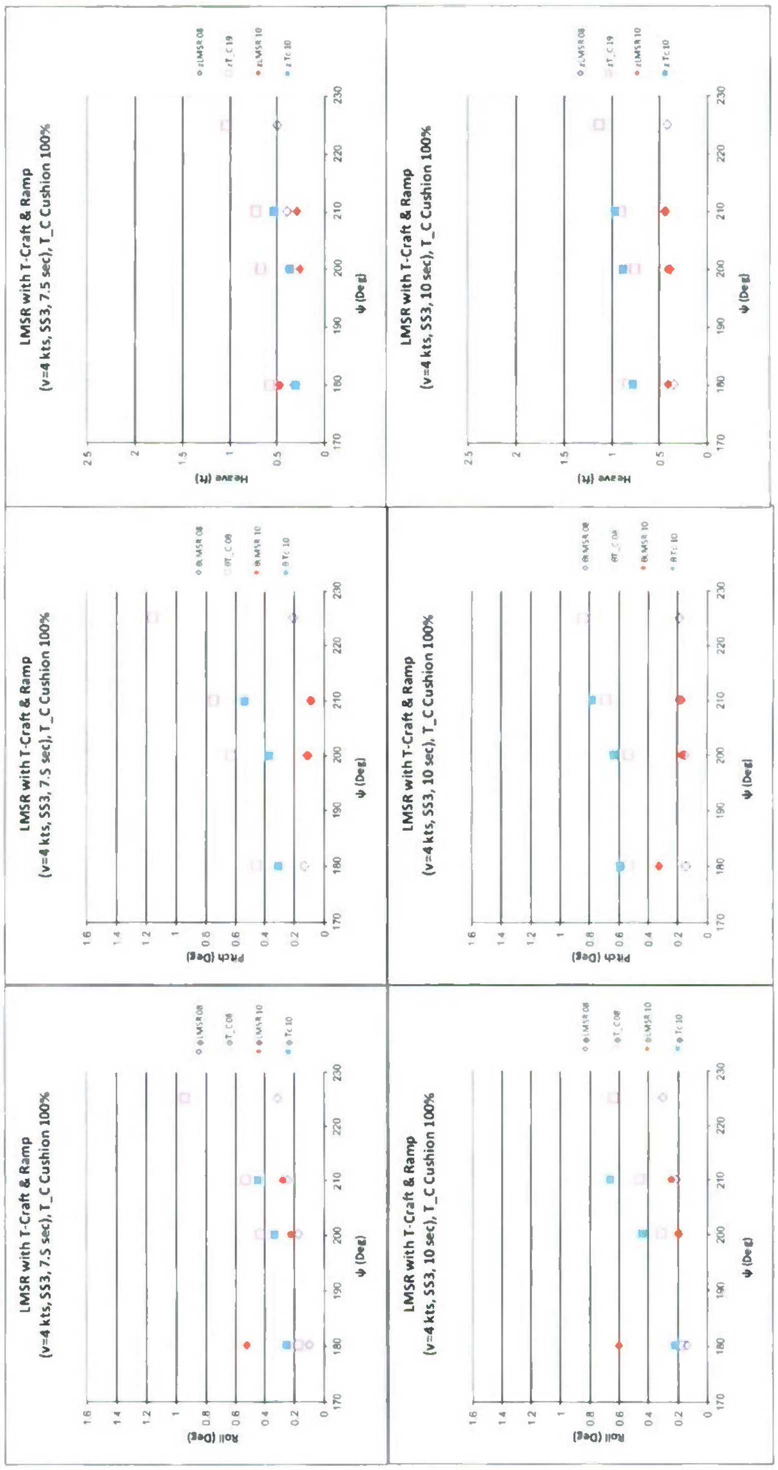


Figure 63. Significant Single Amplitude motions versus relative wave heading for the T-Craft and LMSR Tandem with ramp in Sea State 3 waves (7.5 & 10 Second Modal Period) at 4 knots

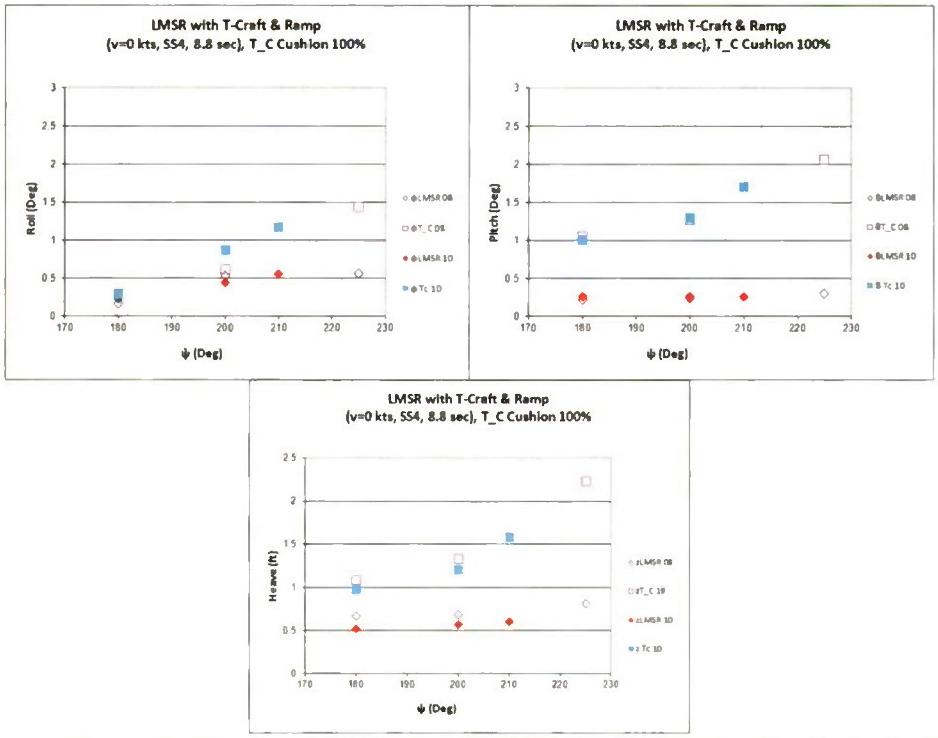


Figure 64. Significant Single Amplitude motions versus heading for the T-Craft and LMSR Tandem with ramp in Sea State 4 (8.8 Second Modal Period) waves at 0 knots

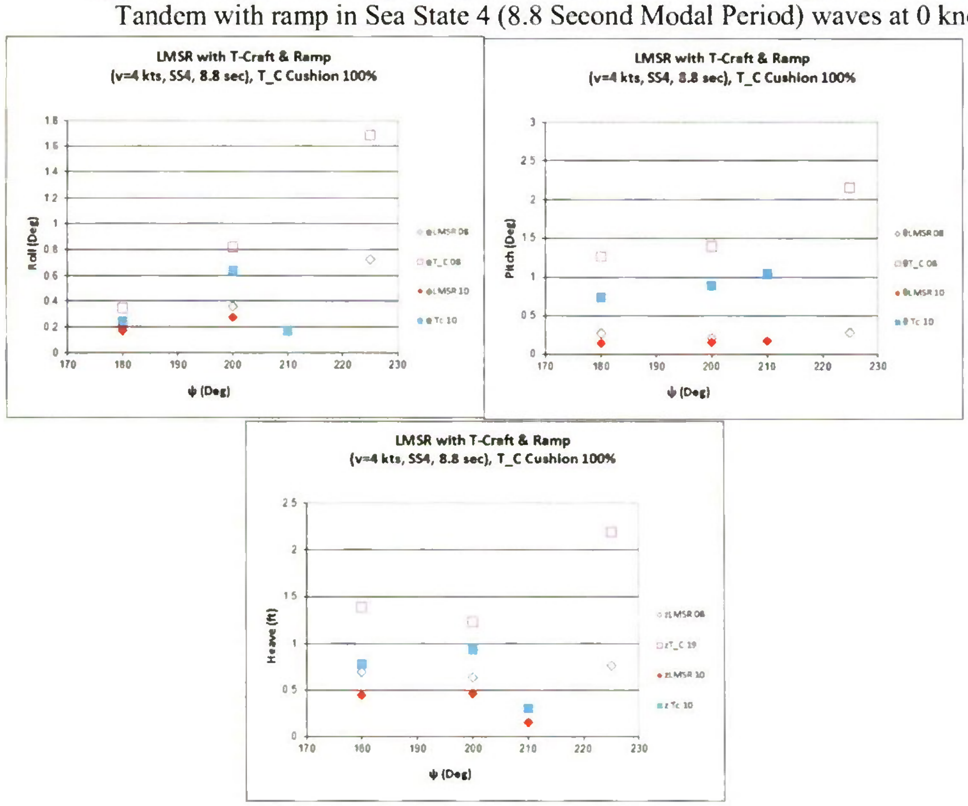


Figure 65. Significant Single Amplitude motions versus heading for the T-Craft and LMSR Tandem with ramp in Sea State 4 (8.8 Second Modal Period) waves at 4 knots

Calm Water Impulse Response Data

Conventional calm water roll decay time history for the LMSR displacement hull is presented in Figure 66. Also shown is a plot of non-dimensional roll decay coefficient, n, versus average roll amplitude presented in Figure 67. The roll period at zero knot ship speed for the LMSR hull was measured to be 18.9 seconds (full-scale). T-Craft impulse response characteristics for pitch, roll and heave are shown for five hull configurations, i.e. 1) barge, 2) Side-by-Side, 3) Tandem half cushion, 4) Tandem full cushion, and 5) Hinged, see Figure 68. The "on cushion" roll response displays a unique echo effect arising from the continuous reflection of waves captured between the twin hulls. T-Craft roll in the Hinged configuration rolls with the LMSR, and displays a conventional displacement hull roll decay curve.

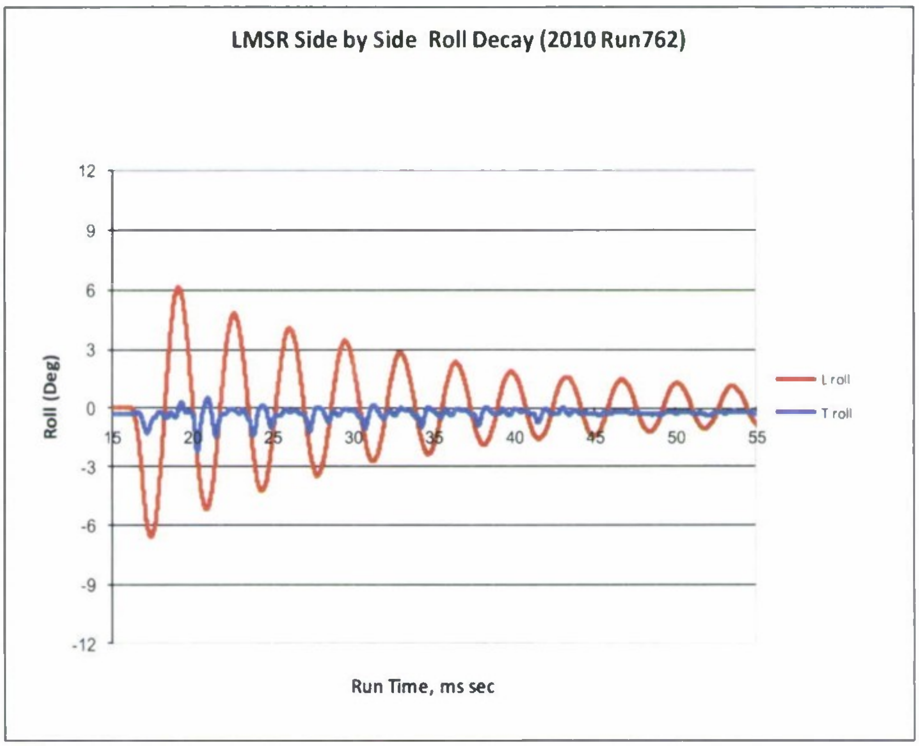


Figure 66. LMSR (L) and T-Craft (T) roll decay time history

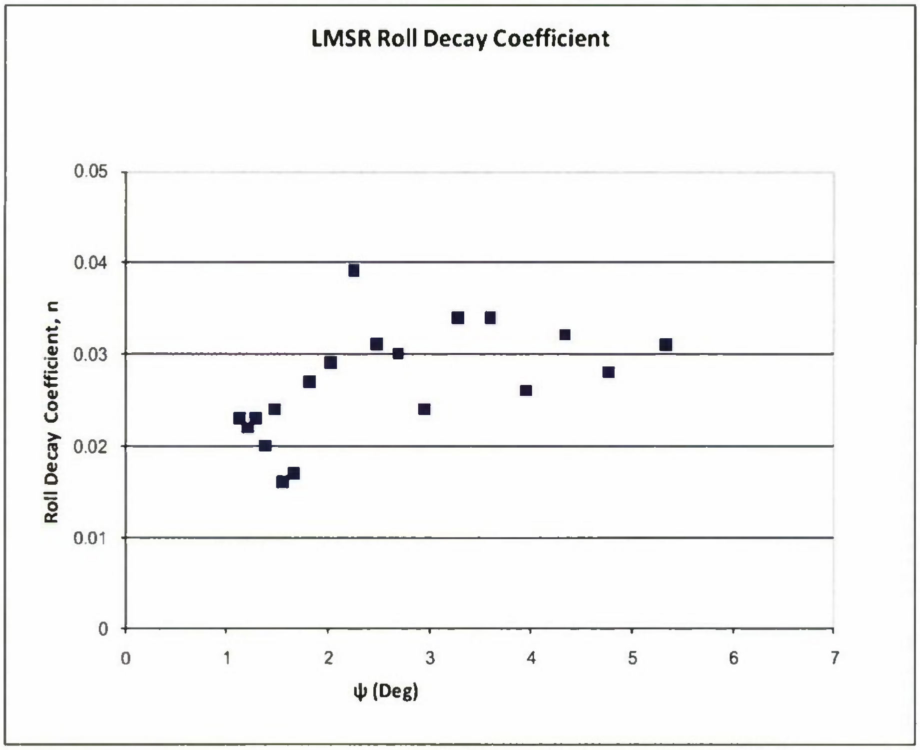


Figure 67. LMSR roll decay coefficient

Figure 68. T-Craft Impulse Response for Roll, Pitch and Heave

SUMMARY AND CONCLUSIONS

A multiple bodied seakeeping model test was conducted to investigate the loads at the hinge points of a ramp in three configurations: Tandem, Hinged and Side-by-Side. This ramp was the connection point between a transformable high-speed sealift vessel (T-Craft) and a large medium speed roll-on roll-off (LMSR) ship. The operating conditions tested included full-scale speeds of zero and four knots at headings of head and bow quartering seas in Sea States 3 and 4 and four different loading conditions of the T-Craft model and ramp.

Looking at the influence of the seaway on the ramp loads, the analysis was narrowed down to low Sea State 3, Sea State 3 bi-modal period and high Sea State 4. This provided a baseline of the low and high end of the force spectrum. Based on the data gathered and observations recorded during the test it can be concluded that extreme loads were highly dependent on vessel configuration, heading and sea condition. Also, the Sea State 3 bi-modal wave spectrum produced significantly larger axial forces in the Side-by-Side configuration than the Sea State 3 unimodal spectrum as shown in Figure 51. This was most probably due to the concentration of wave energy at the 15-second modal period which both passed through the LMSR inducing more motions of the T-Craft and caused the LMSR to slightly increase roll.

The different seabase configurations produced different loading conditions on the ramp connections. The Tandem and Side-by-Side configurations produced higher loads (F_x) compared to the Hinged configuration. The Tandem configuration (see Figure 1) exposed the T-Craft to the largest wave encounters. The 45.68 inch ramp extended the distance between the LMSR and the T-Craft creating a moment arm that led to higher loads on the LMSR stern load cells. When in the Hinged and Side-by-Side configurations (see Figures 2 and 3 respectively) the T-Craft was either sheltered from the large wave encounters by the LMSR or it was in such close proximity of the LMSR that no great moments were generated. However, in the Side-by-Side configuration, the longer period waves of the Sea State 3 bi-modal spectrum passed through the LMSR exciting the T-Craft and slightly increasing the roll of the LMSR contributed to higher forces at the LMSR end of the ramp connection points.

The different operating conditions and loading of the T-Craft also had an effect on the ramp loads. The axial ramp loads (F_x) were dependent on speed and heading. As shown in Figures 52 through 54, the axial loads increased significantly from head to bow sea conditions for the Tandem and Hinged configurations. In fact, an oblique wave heading of 210 degrees produced such large ramp loads (F_x) that the high Sea State 4 - 11.3 seconds modal period condition was dropped from the test matrix as being too dangerous to test in that condition. There was also a consistent increase in the axial loads as the ship speed went from zero to four knots for the Tandem and Hinged configurations. This was not the case for the Side-by-Side configuration, however. The T-Craft and ramp loading conditions produced a slight increase in the axial force as shown in Figure 51, but was not a limiting factor to motions or ramp loads. The Hinged configuration produced small pitch angle variations (bow up) under varying loads. Ramp stiffness, as each was constructed for this test, had no major influence on the motions of each vessel.

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The authors would like to thank Dr. John O'Dea and Mr. Thomas Brady (Code 6500) for their insightful comments and help during the design of the test, constructing the test matrix, and review of the report.

Additionally, the following individuals contributed to the success of the test:

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- Jesus Rosario (Code 6500)
- Bob Sarbacker, Dennis Ralston, Keo Chum, Demetrius Govotsos and Lloyd McCoy (Code 5105)

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APPENDIX A

Table A 1. Matrix on Test Conditions

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
1	ND		Regular	1	0.4		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
2	69		Regular	1	0.5		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
3	67		Regular	1	0.6		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
4	63,65		Regular	1	0.7		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
5	61		Regular	1	0.8		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
6	59		Regular	1	0.9		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
7	57		Regular	1	1		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
8	55		Regular	1	1.1		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
9	52		Regular	1	1.2		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
10	45		Regular	1	1.3		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
11	ND		Regular	1	0.4		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
12	70		Regular	1	0.5		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
13	68		Regular	1	0.6		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
14	64, 66		Regular	1	0.7		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
15	62		Regular	1	0.8		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
16	60		Regular	1	0.9		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
17	58		Regular	1	1		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
18	56		Regular	1	1.1		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
19	53		Regular	1	1.2		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
20	46		Regular	1	1.3		200	4	No Load	Foam	Tandem	Instrumented Ramp from LMSR
21	76	A	4	1.88	8.8		180	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
22	73, 75	A	4	1.88	8.8		200	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
23	74	A	4	1.88	8.8		210	0	No Load	Foam	Tandem	Instrumented Ramp from LMSR
24	88	A	4	1.88	8.8		180	0	No Load	Foam	Tandem	No ramp in between
25	90	A	4	1.88	8.8		200	0	No Load	Foam	Tandem	No ramp in between
26	89	A	4	1.88	8.8		210	0	No Load	Foam	Tandem	No ramp in between
27	ND		Regular	1	0.4		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
28	125		Regular	1	0.5		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
29	123		Regular	1	0.6		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
30	119		Regular	1	0.7		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
31	117		Regular	1	0.8		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
32	115		Regular	1	0.9		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
33	112, 113		Regular	1	1.0		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
34	110		Regular	1	1.1		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
35	107,108		Regular	1	1.2		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
36	100,105		Regular	1	1.3		200	0	No Load	Full	Tandem	Instrumented Ramp from LMSR
37	ND		Regular	1	0.4		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
38	126		Regular	1	0.5		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
39	124		Regular	1	0.6		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
40	120		Regular	1	0.7		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
41	118		Regular	1	0.8		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
42	116		Regular	1	0.9		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
43	114		Regular	1	1.0		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
44	111		Regular	1	1.1		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
45	109		Regular	1	1.2		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
46	101,106		Regular	1	1.3		200	4	No Load	Full	Tandem	Instrumented Ramp from LMSR
47	166,167		3	0.88	7.5		180	0	No Load	Full	Tandem	Instrumented Ramp
48	127		3	0.88	7.5		200	0	No Load	Full	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
49	186		3	0.88	7.5		210	0	No Load	Full	Tandem	Instrumented Ramp
50	171, 175		3	0.88	7.5		180	4	No Load	Full	Tandem	Instrumented Ramp
51	128,129		3	0.88	7.5		200	4	No Load	Full	Tandem	Instrumented Ramp
52	190,191		3	0.88	7.5		210	4	No Load	Full	Tandem	Instrumented Ramp
53	240		3	1.25	10		180	0	No Load	Full	Tandem	Instrumented Ramp
54	224		3	1.25	10		200	0	No Load	Full	Tandem	Instrumented Ramp
55	218		3	1.25	10		210	0	No Load	Full	Tandem	Instrumented Ramp
56	241,242		3	1.25	10		180	4	No Load	Full	Tandem	Instrumented Ramp
57	229,230,231		3	1.25	10		200	4	No Load	Full	Tandem	Instrumented Ramp
58	222,223		3	1.25	10		210	4	No Load	Full	Tandem	Instrumented Ramp
59	176		4	1.88	8.8		180	0	No Load	Full	Tandem	Instrumented Ramp
60	134		4	1.88	8.8		200	0	No Load	Full	Tandem	Instrumented Ramp
61	205		4	1.88	8.8		210	0	No Load	Full	Tandem	Instrumented Ramp
62	179,181		4	1.88	8.8		180	4	No Load	Full	Tandem	Instrumented Ramp
63	135		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
64	136		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
65	137		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
66	138		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
67	139		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
68	140		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
69	141		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
70	142		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
71	143		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
72	144		4	1.88	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
73	208,209		4	1.88	8.8		210	4	No Load	Full	Tandem	Instrumented Ramp
74	160		3	1.25	7.5	15	180	0	No Load	Full	Tandem	Instrumented Ramp
75	154		3	1.25	7.5	15	200	0	No Load	Full	Tandem	Instrumented Ramp
76	192		3	1.25	7.5	15	210	0	No Load	Full	Tandem	Instrumented Ramp
77	164,165		3	1.25	7.5	15	180	4	No Load	Full	Tandem	Instrumented Ramp
78	155,156		3	1.25	7.5	15	200	4	No Load	Full	Tandem	Instrumented Ramp
79	196,197,198		3	1.25	7.5	15	210	4	No Load	Full	Tandem	Instrumented Ramp
80	168		3	0.88	7.5		180	0	No Load	Half	Tandem	Instrumented Ramp
81	130		3	0.88	7.5		200	0	No Load	Half	Tandem	Instrumented Ramp
82	187		3	0.88	7.5		210	0	No Load	Half	Tandem	Instrumented Ramp
83	169,170		3	0.88	7.5		180	4	No Load	Half	Tandem	Instrumented Ramp
84	131,132		3	0.88	7.5		200	4	No Load	Half	Tandem	Instrumented Ramp
85	188,189		3	0.88	7.5		210	4	No Load	Half	Tandem	Instrumented Ramp
86	239		3	1.25	10		180	0	No Load	Half	Tandem	Instrumented Ramp
87	226		3	1.25	10		200	0	No Load	Half	Tandem	Instrumented Ramp
88	219		3	1.25	10		210	0	No Load	Half	Tandem	Instrumented Ramp
89	243,244		3	1.25	10		180	4	No Load	Half	Tandem	Instrumented Ramp
90	227,228		3	1.25	10		200	4	No Load	Half	Tandem	Instrumented Ramp
91	220,221		3	1.25	10		210	4	No Load	Half	Tandem	Instrumented Ramp
92	177		4	1.88	8.8		180	0	No Load	Half	Tandem	Instrumented Ramp
93	146,148		4	1.88	8.8		200	0	No Load	Half	Tandem	Instrumented Ramp
94	206		4	1.88	8.8		210	0	No Load	Half	Tandem	Instrumented Ramp
95	182,183		4	1.88	8.8		180	4	No Load	Half	Tandem	Instrumented Ramp
96	149,150		4	1.88	8.8		200	4	No Load	Half	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
97	210,211		4	1.88	8.8		210	4	No Load	Half	Tandem	Instrumented Ramp
98	161		3	1.25	7.5	15	180	0	No Load	Half	Tandem	Instrumented Ramp
99	157		3	1.25	7.5	15	200	0	No Load	Half	Tandem	Instrumented Ramp
100	193		3	1.25	7.5	15	210	0	No Load	Half	Tandem	Instrumented Ramp
101	162,163		3	1.25	7.5	15	180	4	No Load	Half	Tandem	Instrumented Ramp
102	158,159		3	1.25	7.5	15	200	4	No Load	Half	Tandem	Instrumented Ramp
103	194,195		3	1.25	7.5	15	210	4	No Load	Half	Tandem	Instrumented Ramp
104	178	A	4	1.88	8.8		180	0	No Load	None	Tandem	Instrumented Ramp from LMSR
105	147	A	4	1.88	8.8		200	0	No Load	None	Tandem	Instrumented Ramp from LMSR
106	207	A	4	1.88	8.8		210	0	No Load	None	Tandem	Instrumented Ramp from LMSR
107	184,185	A	4	1.88	8.8		180	4	No Load	None	Tandem	Instrumented Ramp from LMSR
108	151.152	A	4	1.88	8.8		200	4	No Load	None	Tandem	Instrumented Ramp from LMSR
109	212,214,215,216	A	4	1.88	8.8		210	4	No Load	None	Tandem	Instrumented Ramp from LMSR
110	322,323		3	0.88	7.5		180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
111	304		3	0.88	7.5		200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
112	276,277		3	0.88	7.5		210	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
113	328		3	0.88	7.5		180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
114	308,309		3	0.88	7.5		200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
115	281, 282		3	0.88	7.5		210	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
116	252		3	1.25	10		180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
117	259		3	1.25	10		200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
118	270		3	1.25	10		210	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
119	253,254,255		3	1.25	10		180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
120	264,265		3	1.25	10		200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
121	271,272,273		3	1.25	10		210	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
122	336		4	1.88	8.8		180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
123	346		4	1.88	8.8		200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
124	355		4	1.88	8.8		210	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
125	338,339		4	1.88	8.8		180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
126	350,351		4	1.88	8.8		200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
127	359,360		4	1.88	8.8		210	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
128	316		3	1.25	7.5	15	180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
129	291		3	1.25	7.5	15	200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
130	283		3	1.25	7.5	15	210	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
131	320,321		3	1.25	7.5	15	180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
132	314,315		3	1.25	7.5	15	200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
133	289,290		3	1.25	7.5	15	210	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
134	323		3	0.88	7.5		180	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
135	305		3	0.88	7.5		200	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
136	278		3	0.88	7.5		210	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
137	325,326		3	0.88	7.5		180	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
138	306,307		3	0.88	7.5		200	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
139	279, 280		3	0.88	7.5		210	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
140	251		3	1.25	10		180	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
141	258		3	1.25	10		200	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
142	269		3	1.25	10		210	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
143	256,257		3	1.25	10		180	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No	Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
144	267,268	3	1.25	10		200	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
145	274,275	3	1.25	10		210	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
146	337	4	1.88	8.8		180	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
147	347	4	1.88	8.8		200	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
148	356	4	1.88	8.8		210	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
149	340,341	4	1.88	8.8		180	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
150	348,349	4	1.88	8.8		200	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
151	357,358	4	1.88	8.8		210	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
152	317	3	1.25	7.5	15	180	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
153	292	3	1.25	7.5	15	200	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
154	284	3	1.25	7.5	15	210	0	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
155	318,319	3	1.25	7.5	15	180	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
156	293,294,295,296,297	3	1.25	7.5	15	200	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
157	287,288	3	1.25	7.5	15	210	4	No Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
158	435	3	0.88	7.5		180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
159	456,457	3	0.88	7.5		200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
160	514	3	0.88	7.5		210	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
161	439,440	3	0.88	7.5		180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
162	459,460	3	0.88	7.5		200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
163	518,519	3	0.88	7.5		210	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
164	495	3	1.25	10		180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
165	483	3	1.25	10		200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
166	507	3	1.25	10		210	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
167	499,500	3	1.25	10		180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
168	487,488,489,490	3	1.25	10		200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
169	512,513	3	1.25	10		210	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
170	447	4	1.88	8.8		180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
171	474	4	1.88	8.8		200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
172	527,536	4	1.88	8.8		210	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
173	451,452	4	1.88	8.8		180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
174	478,479	4	1.88	8.8		200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
175	529,530,537,538	4	1.88	8.8		210	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
176	441	3	1.25	7.5	15	180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
177	466	3	1.25	7.5	15	200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
178	520	3	1.25	7.5	15	210	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
179	445,446	3	1.25	7.5	15	180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
180	472,473	3	1.25	7.5	15	200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
181	525,526	3	1.25	7.5	15	210	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
182	436	3	0.88	7.5		180	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
183	458	3	0.88	7.5		200	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
184	515	3	0.88	7.5		210	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
185	437,438	3	0.88	7.5		180	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
186	461,462	3	0.88	7.5		200	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
187	516,517	3	0.88	7.5		210	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
188	496	3	1.25	10		180	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
189	484	3	1.25	10		200	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No	Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
190	508	3	1.25	10		210	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
191	497,498	3	1.25	10		180	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
192	485,486	3	1.25	10		200	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
193	510,511	3	1.25	10		210	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
194	448	4	1.88	8.8		180	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
195	475	4	1.88	8.8		200	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
196	528,535	4	1.88	8.8		210	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
197	449,450	4	1.88	8.8		180	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
198	476,477	4	1.88	8.8		200	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
199	539,540	4	1.88	8.8		210	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
200	442	3	1.25	7.5	15	180	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
201	468	3	1.25	7.5	15	200	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
202	521	3	1.25	7.5	15	210	0	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
203	443,444	3	1.25	7.5	15	180	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
204	469,470,471	3	1.25	7.5	15	200	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
205	523,524	3	1.25	7.5	15	210	4	Full Load - 4 Tanks	Half	Tandem	Instrumented Ramp
206	618	3	0.88	7.5		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
207	592	3	0.88	7.5		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
208	544	3	0.88	7.5		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
209	622,623	3	0.88	7.5		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
210	597,600	3	0.88	7.5		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
211	545,546	3	0.88	7.5		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
212	681	3	1.25	10		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
213	669	3	1.25	10		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
214	675	3	1.25	10		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
215	685,686	3	1.25	10		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
216	673,674	3	1.25	10		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
217	679,680	3	1.25	10		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
218	630	4	1.88	8.8		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
219	582	4	1.88	8.8		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
220	574	4	1.88	8.8		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
221	637,638	4	1.88	8.8		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
222	587,588	4	1.88	8.8		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
223	579,580	4	1.88	8.8		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
224	624	3	1.25	7.5	15	180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
225	601	3	1.25	7.5	15	200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
226	567	3	1.25	7.5	15	210	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
227	628,629	3	1.25	7.5	15	180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
228	606,608	3	1.25	7.5	15	200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
229	571,573	3	1.25	7.5	15	210	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
230	619		3	0.88	7.5		180	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
231	593		3	0.88	7.5		200	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
232	543		3	0.88	7.5		210	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
233	620,621		3	0.88	7.5		180	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
234	595,596		3	0.88	7.5		200	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
235	548,549		3	0.88	7.5		210	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
236	682		3	1.25	10		180	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
237	670		3	1.25	10		200	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
238	676		3	1.25	10		210	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
239	683,684		3	1.25	10		180	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
240	671,672		3	1.25	10		200	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
241	677,678		3	1.25	10		210	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
242	631		4	1.88	8.8		180	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
243	583		4	1.88	8.8		200	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
244	575		4	1.88	8.8		210	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
245	632,634		4	1.88	8.8		180	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
246	584,585		4	1.88	8.8		200	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
247	576,578		4	1.88	8.8		210	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
248	625		3	1.25	7.5	15	180	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
249	602		3	1.25	7.5	15	200	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
250	568		3	1.25	7.5	15	210	0	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
251	626,627		3	1.25	7.5	15	180	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
252	603,604		3	1.25	7.5	15	200	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
253	569,570		3	1.25	7.5	15	210	4	Full Load w/ Tank on Ramp	Half	Tandem	Instrumented Ramp
254	732		3	0.88	7.5		180	0	No Load	Full	Side by Side	Instrumented Ramp
255	745		3	0.88	7.5		200	0	No Load	Full	Side by Side	Instrumented Ramp
256	785		3	0.88	7.5		210	0	No Load	Full	Side by Side	Instrumented Ramp
257	733,734		3	0.88	7.5		180	4	No Load	Full	Side by Side	Instrumented Ramp
258	746,747		3	0.88	7.5		200	4	No Load	Full	Side by Side	Instrumented Ramp
259	783,784		3	0.88	7.5		210	4	No Load	Full	Side by Side	Instrumented Ramp
260	731		3	1.25	10		180	0	No Load	Full	Side by Side	Instrumented Ramp
261	723		3	1.25	10		200	0	No Load	Full	Side by Side	Instrumented Ramp
262	728		3	1.25	10		210	0	No Load	Full	Side by Side	Instrumented Ramp
263	729,730		3	1.25	10		180	4	No Load	Full	Side by Side	Instrumented Ramp
264	724,725		3	1.25	10		200	4	No Load	Full	Side by Side	Instrumented Ramp
265	726,727		3	1.25	10		210	4	No Load	Full	Side by Side	Instrumented Ramp
266	738		4	1.88	8.8		180	0	No Load	Full	Side by Side	Instrumented Ramp
267	741		4	1.88	8.8		200	0	No Load	Full	Side by Side	Instrumented Ramp
268	754		4	1.88	8.8		210	0	No Load	Full	Side by Side	Instrumented Ramp
269	739,740		4	1.88	8.8		180	4	No Load	Full	Side by Side	Instrumented Ramp
270	742,744		4	1.88	8.8		200	4	No Load	Full	Side by Side	Instrumented Ramp
271	755,756		4	1.88	8.8		210	4	No Load	Full	Side by Side	Instrumented Ramp
272	737		3	1.25	7.5	15	180	0	No Load	Full	Side by Side	Instrumented Ramp
273	748		3	1.25	7.5	15	200	0	No Load	Full	Side by Side	Instrumented Ramp
274	751		3	1.25	7.5	15	210	0	No Load	Full	Side by Side	Instrumented Ramp
275	735,736		3	1.25	7.5	15	180	4	No Load	Full	Side by Side	Instrumented Ramp
276	749,750		3	1.25	7.5	15	200	4	No Load	Full	Side by Side	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
277	752,753		3	1.25	7.5	15	210	4	No Load	Full	Side by Side	Instrumented Ramp
278	833		3	0.88	7.5		180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
279	807		3	0.88	7.5		200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
280	787		3	0.88	7.5		210	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
281	831,832		3	0.88	7.5		180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
282	818,820		3	0.88	7.5		200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
283	788,789		3	0.88	7.5		210	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
284	842		3	1.25	10		180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
285	801		3	1.25	10		200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
286	796		3	1.25	10		210	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
287	840,841		3	1.25	10		180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
288	799,800		3	1.25	10		200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
289	797,798		3	1.25	10		210	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
290	837		4	1.88	8.8		180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
291	825		4	1.88	8.8		200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
292	793		4	1.88	8.8		210	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
293	838,839		4	1.88	8.8		180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
294	826,827		4	1.88	8.8		200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
295	794,795		4	1.88	8.8		210	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
296	834		3	1.25	7.5	15	180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
297	824		3	1.25	7.5	15	200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
298	790		3	1.25	7.5	15	210	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
299	835,836		3	1.25	7.5	15	180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
300	821,822		3	1.25	7.5	15	200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
301	791,792		3	1.25	7.5	15	210	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
302	963		3	0.88	7.5		180	0	Full Load	Full	Side by Side	Instrumented Ramp
303	949		3	0.88	7.5		200	0	Full Load	Full	Side by Side	Instrumented Ramp
304	926		3	0.88	7.5		210	0	Full Load	Full	Side by Side	Instrumented Ramp
305	964,965		3	0.88	7.5		180	4	Full Load	Full	Side by Side	Instrumented Ramp
306	947,948		3	0.88	7.5		200	4	Full Load	Full	Side by Side	Instrumented Ramp
307	927,928		3	0.88	7.5		210	4	Full Load	Full	Side by Side	Instrumented Ramp
308	969		3	1.25	10		180	0	Full Load	Full	Side by Side	Instrumented Ramp
309	941		3	1.25	10		200	0	Full Load	Full	Side by Side	Instrumented Ramp
310	936		3	1.25	10		210	0	Full Load	Full	Side by Side	Instrumented Ramp
311	970,971		3	1.25	10		180	4	Full Load	Full	Side by Side	Instrumented Ramp
312	942,943		3	1.25	10		200	4	Full Load	Full	Side by Side	Instrumented Ramp
313	937,938		3	1.25	10		210	4	Full Load	Full	Side by Side	Instrumented Ramp
314	960		4	1.88	8.8		180	0	Full Load	Full	Side by Side	Instrumented Ramp
315	954		4	1.88	8.8		200	0	Full Load	Full	Side by Side	Instrumented Ramp
316	932		4	1.88	8.8		210	0	Full Load	Full	Side by Side	Instrumented Ramp
317	961,962		4	1.88	8.8		180	4	Full Load	Full	Side by Side	Instrumented Ramp
318	958,959		4	1.88	8.8		200	4	Full Load	Full	Side by Side	Instrumented Ramp
319	934,935		4	1.88	8.8		210	4	Full Load	Full	Side by Side	Instrumented Ramp
320	966		3	1.25	7.5	15	180	0	Full Load	Full	Side by Side	Instrumented Ramp
321	950		3	1.25	7.5	15	200	0	Full Load	Full	Side by Side	Instrumented Ramp
322	931		3	1.25	7.5	15	210	0	Full Load	Full	Side by Side	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
323	967,968		3	1.25	7.5	15	180	4	Full Load	Full	Side by Side	Instrumented Ramp
324	952,953		3	1.25	7.5	15	200	4	Full Load	Full	Side by Side	Instrumented Ramp
325	929,930		3	1.25	7.5	15	210	4	Full Load	Full	Side by Side	Instrumented Ramp
326	871		3	0.88	7.5		180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
327	883		3	0.88	7.5		200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
328	900		3	0.88	7.5		210	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
329	872,873		3	0.88	7.5		180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
330	884,885		3	0.88	7.5		200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
331	901,902		3	0.88	7.5		210	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
332	850		3	1.25	10		180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
333	889		3	1.25	10		200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
334	897		3	1.25	10		210	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
335	848,849		3	1.25	10		180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
336	890,891		3	1.25	10		200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
337	898,899		3	1.25	10		210	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
338	877		4	1.88	8.8		180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
339	882		4	1.88	8.8		200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
340	906		4	1.88	8.8		210	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
341	878,879		4	1.88	8.8		180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
342	880,881		4	1.88	8.8		200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
343	907,909		4	1.88	8.8		210	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
344	874		3	1.25	7.5	15	180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
345	886		3	1.25	7.5	15	200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
346	903		3	1.25	7.5	15	210	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
347	875,876		3	1.25	7.5	15	180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
348	887,888		3	1.25	7.5	15	200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
349	904,905		3	1.25	7.5	15	210	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
350	1032		3	0.88	7.5		180	0	No Load	Full	Tandem	Hinged Connection
351	1063		3	0.88	7.5		200	0	No Load	Full	Tandem	Hinged Connection
352	1079		3	0.88	7.5		210	0	No Load	Full	Tandem	Hinged Connection
353	1029,1031		3	0.88	7.5		180	4	No Load	Full	Tandem	Hinged Connection
354	1061,1062		3	0.88	7.5		200	4	No Load	Full	Tandem	Hinged Connection
355	1080,1081		3	0.88	7.5		210	4	No Load	Full	Tandem	Hinged Connection
356	1026		3	1.25	10		180	0	No Load	Full	Tandem	Hinged Connection
357	1042		3	1.25	10		200	0	No Load	Full	Tandem	Hinged Connection
358	1085		3	1.25	10		210	0	No Load	Full	Tandem	Hinged Connection
359	1027,1028		3	1.25	10		180	4	No Load	Full	Tandem	Hinged Connection
360	1056,1057		3	1.25	10		200	4	No Load	Full	Tandem	Hinged Connection
361	1086,1087		3	1.25	10		210	4	No Load	Full	Tandem	Hinged Connection
362	1036		4	1.88	8.8		180	0	No Load	Full	Tandem	Hinged Connection
363	1075		4	1.88	8.8		200	0	No Load	Full	Tandem	Hinged Connection
364	1078		4	1.88	8.8		210	0	No Load	Full	Tandem	Hinged Connection
365	1037,1038		4	1.88	8.8		180	4	No Load	Full	Tandem	Hinged Connection
366	1073,1074		4	1.88	8.8		200	4	No Load	Full	Tandem	Hinged Connection
367	1076,1077		4	1.88	8.8		210	4	No Load	Full	Tandem	Hinged Connection
368	1035		3	1.25	7.5	15	180	0	No Load	Full	Tandem	Hinged Connection
369	1064		3	1.25	7.5	15	200	0	No Load	Full	Tandem	Hinged Connection

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm$_{swell}$ (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
370	1082		3	1.25	7.5	15	210	0	No Load	Full	Tandem	Hinged Connection
371	1033-1034		3	1.25	7.5	15	180	4	No Load	Full	Tandem	Hinged Connection
372	1066-1071		3	1.25	7.5	15	200	4	No Load	Full	Tandem	Hinged Connection
373	1083,1084		3	1.25	7.5	15	210	4	No Load	Full	Tandem	Hinged Connection
374	1095		3	0.88	7.5		180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
375	1108		3	0.88	7.5		200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
376	1131		3	0.88	7.5		210	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
377	1096,1097		3	0.88	7.5		180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
378	1109,1110		3	0.88	7.5		200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
379	1029,1030		3	0.88	7.5		210	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
380	1091		3	1.25	10		180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
381	1119		3	1.25	10		200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
382	1124		3	1.25	10		210	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
383	1089,1090		3	1.25	10		180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
384	1122,1123		3	1.25	10		200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
385	1125,1126		3	1.25	10		210	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
386	1101		4	1.88	8.8		180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
387	1106		4	1.88	8.8		200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
388	1135		4	1.88	8.8		210	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
389	1102,1103		4	1.88	8.8		180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
390	1104,1105		4	1.88	8.8		200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
391	1136,1137		4	1.88	8.8		210	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
392	1098		3	1.25	7.5	15	180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
393	1111		3	1.25	7.5	15	200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
394	1134		3	1.25	7.5	15	210	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
395	1099,1100		3	1.25	7.5	15	180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
396	1112,1114		3	1.25	7.5	15	200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
397	1132,1133		3	1.25	7.5	15	210	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
398	1197		3	0.88	7.5		180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
399	1209		3	0.88	7.5		200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
400	1227		3	0.88	7.5		210	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
401	1195,1196		3	0.88	7.5		180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
402	1210,1211		3	0.88	7.5		200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
403	1228,1230		3	0.88	7.5		210	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
404	1187		3	1.25	10		180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
405	1218		3	1.25	10		200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
406	1222		3	1.25	10		210	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
407	1188,1189		3	1.25	10		180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
408	1219,1221		3	1.25	10		200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
409	1223,1225		3	1.25	10		210	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
410	1201		4	1.88	8.8		180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
411	1206		4	1.88	8.8		200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
412	1235		4	1.88	8.8		210	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
413	1203,1205		4	1.88	8.8		180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
414	1207,1208		4	1.88	8.8		200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
415	1236,1237		4	1.88	8.8		210	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
416	1198		3	1.25	7.5	15	180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
417	1212		3	1.25	7.5	15	200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
418	1231		3	1.25	7.5	15	210	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
419	1199,1200		3	1.25	7.5	15	180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
420	1213,1214		3	1.25	7.5	15	200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
421	1232,12333		3	1.25	7.5	15	210	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
422	1173		3	0.88	7.5		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
423	1160		3	0.88	7.5		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
424	1139		3	0.88	7.5		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
425	1171,1172		3	0.88	7.5		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
426	1158,1159		3	0.88	7.5		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
427	1140,1141		3	0.88	7.5		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
428	1182		3	1.25	10		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
429	1154		3	1.25	10		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
430	1148		3	1.25	10		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
431	1180,1181		3	1.25	10		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
432	1152,1153		3	1.25	10		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
433	1149,1150		3	1.25	10		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
434	1177		4	1.88	8.8		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
435	1165		4	1.88	8.8		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
436	1145		4	1.88	8.8		210	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
437	1178,1179		4	1.88	8.8		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
438	1167,1168		4	1.88	8.8		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
439	1146,1147		4	1.88	8.8		210	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
440	1174		3	1.25	7.5	15	180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
441	1161		3	1.25	7.5	15	200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
442	1142		3	1.25	7.5	15	210	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
443	1175,1176		3	1.25	7.5	15	180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
444	1162,1164		3	1.25	7.5	15	200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
445	1143,1144		3	1.25	7.5	15	210	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
446	ND		Regular	1	0.4		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
447	ND		Regular	1	0.5		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
448	ND		Regular	1	0.6		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
449	ND		Regular	1	0.7		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
450	ND		Regular	1	0.8		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
451	ND		Regular	1	0.9		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
452	ND		Regular	1	1		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
453	ND		Regular	1	1.1		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
454	ND		Regular	1	1.2		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
455	ND		Regular	1	1.3		110	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
456	ND		Regular	1	0.4		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
457	ND		Regular	1	0.5		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
458	ND		Regular	1	0.6		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
459	ND		Regular	1	0.7		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
460	ND		Regular	1	0.8		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
461	ND		Regular	1	0.9		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
462	ND		Regular	1	1		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
463	ND		Regular	1	1.1		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
464	ND		Regular	1	1.2		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
465	ND		Regular	1	1.3		90	0	No Load	Full	Med Moor	Med Moored w/ Instrumented Ramp
466	ND	A	3	1.25	10		290	0	No Load	Full	Side by Side	Instrumented Ramp
467	ND	A	3	1.25	10		290	4	No Load	Full	Side by Side	Instrumented Ramp
468	ND	A	3	1.25	10		290	0	No Load	Full	Tandem	Hinged Connection
469	ND	A	3	1.25	10		290	4	No Load	Full	Tandem	Hinged Connection
470	364		4	2.5	8.8		180	0	No Load	Full	Tandem	Instrumented Ramp
471	361		4	2.5	8.8		200	0	No Load	Full	Tandem	Instrumented Ramp
472	365,366		4	2.5	8.8		180	4	No Load	Full	Tandem	Instrumented Ramp
473	362,363		4	2.5	8.8		200	4	No Load	Full	Tandem	Instrumented Ramp
474	342,343		4	2.5	8.8		180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
475	352		4	2.5	8.8		200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
476	344,345		4	2.5	8.8		180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
477	353,354		4	2.5	8.8		200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
478	702		4	2.5	11.3		180	0	No Load	Full	Tandem	Instrumented Ramp
479	707		4	2.5	11.3		200	0	No Load	Full	Tandem	Instrumented Ramp
480	703,704		4	2.5	11.3		180	4	No Load	Full	Tandem	Instrumented Ramp
481	705,706		4	2.5	11.3		200	4	No Load	Full	Tandem	Instrumented Ramp
482	701		4	2.5	11.3		180	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
483	696		4	2.5	11.3		200	0	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
484	699,700		4	2.5	11.3		180	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
485	697,698		4	2.5	11.3		200	4	No Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
486	453		4	2.5	8.8		180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
487	480		4	2.5	8.8		200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
488	454,455		4	2.5	8.8		180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
489	481,482		4	2.5	8.8		200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
490	639		4	2.5	8.8		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
491	609		4	2.5	8.8		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
492	641,642		4	2.5	8.8		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
493	610-612		4	2.5	8.8		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
494	501		4	2.5	11.3		180	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
495	491		4	2.5	11.3		200	0	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
496	502,503		4	2.5	11.3		180	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
497	493,494		4	2.5	11.3		200	4	Full Load - 4 Tanks	Full	Tandem	Instrumented Ramp
498	687		4	2.5	11.3		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
499	691		4	2.5	11.3		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
500	688,690		4	2.5	11.3		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
501	692,693		4	2.5	11.3		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Instrumented Ramp
502	ND		4	2.5	8.8		180	0	No Load	Full	Side by Side	Instrumented Ramp
503	ND		4	2.5	8.8		200	0	No Load	Full	Side by Side	Instrumented Ramp
504	ND		4	2.5	8.8		180	4	No Load	Full	Side by Side	Instrumented Ramp
505	ND		4	2.5	8.8		200	4	No Load	Full	Side by Side	Instrumented Ramp
506	ND		4	2.5	8.8		180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
507	ND		4	2.5	8.8		200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
508	ND		4	2.5	8.8		180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
509	ND		4	2.5	8.8		200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
510	ND		4	2.5	8.8		180	0	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
511	ND		4	2.5	8.8		200	0	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
512	ND		4	2.5	8.8		180	4	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
513	ND		4	2.5	8.8		200	4	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
514	ND		4	2.5	8.8		180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
515	ND		4	2.5	8.8		200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
516	ND		4	2.5	8.8		180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
517	ND		4	2.5	8.8		200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
518	717		4	2.5	11.3		180	0	No Load	Full	Side by Side	Instrumented Ramp
519	722		4	2.5	11.3		200	0	No Load	Full	Side by Side	Instrumented Ramp
520	718,719		4	2.5	11.3		180	4	No Load	Full	Side by Side	Instrumented Ramp
521	720,721		4	2.5	11.3		200	4	No Load	Full	Side by Side	Instrumented Ramp
522	843		4	2.5	11.3		180	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
523	803		4	2.5	11.3		200	0	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
524	844,845		4	2.5	11.3		180	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
525	804,805		4	2.5	11.3		200	4	No Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
526	975		4	2.5	11.3		180	0	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
527	944		4	2.5	11.3		200	0	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
528	973,974		4	2.5	11.3		180	4	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
529	945,946		4	2.5	11.3		200	4	Full Load - 4 Tanks	Full	Side by Side	Instrumented Ramp
530	851		4	2.5	11.3		180	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
531	892		4	2.5	11.3		200	0	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
532	852,853		4	2.5	11.3		180	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
533	893,894		4	2.5	11.3		200	4	Full Load w/ Tank on Ramp	Full	Side by Side	Instrumented Ramp
534	ND		4	2.5	8.8		180	0	No Load	Full	Tandem	Hinged Connection
535	ND		4	2.5	8.8		200	0	No Load	Full	Tandem	Hinged Connection
536	ND		4	2.5	8.8		180	4	No Load	Full	Tandem	Hinged Connection
537	ND		4	2.5	8.8		200	4	No Load	Full	Tandem	Hinged Connection
538	ND		4	2.5	8.8		180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
539	ND		4	2.5	8.8		200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
540	ND		4	2.5	8.8		180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
541	ND		4	2.5	8.8		200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection

Table A 1. Matrix of Test Conditions (continued)

Condition No	Test Run No		Sea State	SWH (m)	Tm (sec)	Tm_{swell} (sec)	Heading	Speed (kts)	T-Craft Load Condition	T-Craft Cushion	Layout	Ramp Configuration
542	ND		4	2.5	8.8		180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
543	ND		4	2.5	8.8		200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
544	ND		4	2.5	8.8		180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
545	ND		4	2.5	8.8		200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
546	ND		4	2.5	8.8		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
547	ND		4	2.5	8.8		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
548	ND		4	2.5	8.8		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
549	ND		4	2.5	8.8		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
550	1039		4	2.5	11.3		180	0	No Load	Full	Tandem	Hinged Connection
551	1058		4	2.5	11.3		200	0	No Load	Full	Tandem	Hinged Connection
552	1040,1041		4	2.5	11.3		180	4	No Load	Full	Tandem	Hinged Connection
553	1059,1060		4	2.5	11.3		200	4	No Load	Full	Tandem	Hinged Connection
554	1092		4	2.5	11.3		180	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
555	1115		4	2.5	11.3		200	0	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
556	1093,1094		4	2.5	11.3		180	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
557	1116,1117		4	2.5	11.3		200	4	No Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
558	1190		4	2.5	11.3		180	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
559	1217		4	2.5	11.3		200	0	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
560	1191,1192		4	2.5	11.3		180	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
561	1215,1216		4	2.5	11.3		200	4	Full Load - 4 Tanks	Full	Tandem	Hinged Connection
562	1186		4	2.5	11.3		180	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
563	1155		4	2.5	11.3		200	0	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
564	1184,1185		4	2.5	11.3		180	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection
565	1156,1157		4	2.5	11.3		200	4	Full Load w/ Tank on Ramp	Full	Tandem	Hinged Connection

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APPENDIX B

Table B 1. Model Test Run Log

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
1-43					cal check runs				
44	BOS Zero at Steps								new position for Qsys-4=off, 1=on deck
45	10	1.3	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		collected at steps
46	20	1.3	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		ok
47	9	1.2	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		collected at stepswrong rpm-wh too hi
48	19	1.2	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		wrong rpm-wh too hi
49	9	1.2	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		collected at stepswrong rpm-wh too hi
50	19	1.2	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		wrong rpm-wh too small
51	BOS Zero at Steps			LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off			
52	9	1.2	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		ok
53	19	1.2	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200		ok
54	Mid Basin Zero								
55	8	1.1	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	0.74	collected at mid basin
56	18	1.1	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	0.74	started from mid basin
57	7	1	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	0.89	collected at mid basin
58	17	1	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	0.89	started from mid basin
59	6	0.9	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.1	collected at mid basin
60	16	0.9	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.1	started from mid basin
61	5	0.8	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.39	collected at mid basin
62	15	0.8	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.39	started from mid basin
63	4	0.7	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.82	collected at mid basin
64	14	0.7	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.82	started from mid basin
65	4	0.7	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.82	collected at mid basin
66	14	0.7	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	1.82	started from mid basin
67	3	0.6	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	2.48	collected at mid basin
68	13	0.6	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	2.48	started from mid basin
69	2	0.5	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	3.58	collected at mid basin
70	12	0.5	4	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	3.58	started from mid basin
71	Zero -After Lunch								collected at steps
72	Zero -After Lunch								collected at mid basin
73	22	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	2.46	SS4
74	23	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	210	2.45	SS4
75	22	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	200	2.46	SS4
76	21	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - Stern Ramp	off	180	2.46	SS4
77	Zero -No-Ramp		0	LMSR/T-C Tandem	Tandem - Barge - No Ramp	off	180		collected at steps
78	Surge Decay		pulled aft	LMSR/T-C Tandem	Tandem - Barge - No Ramp	Exceeded Cal Limit- Need to repeat w new cal			
79	Sway Decay		pulled to po	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
80	Heave Decay		down	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
81	Heave Decay		down	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
82	Roll Decay		port down	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
83	Pitch Decay		stern down	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
84	Yaw Decay		bow to por	LMSR/T-C Tandem	Tandem - Barge - No Ramp				
85	Surge Decay		pushed fwd	LMSR/T-C Tandem	Tandem - Barge - No Ramp				collected at steps
86	BOS Zero at Steps			LMSR/T-C Tandem	Tandem - Barge - No Ramp				collected at steps
87	Zero at Mid Basin			LMSR/T-C Tandem	Tandem - Barge - No Ramp				collected at mid basin
88	24	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - No Ramp	off	180	2.46	SS4
89	26	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - No Ramp	off	210	2.46	SS4
90	25	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Barge - No Ramp	off	200	2.46	SS4

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
91	ydrostatic Roll -5lbs to Stbd				No Ramp-No Bridal	7.5 inches to stbd			
92	ydrostatic Roll -5lbs to Stbd			NG	No Ramp-No Bridal	75 inches to 5 inches fwd LCG			
93	Hydrostatic Roll -5lbs to Port				No Ramp-No Bridal	75 inches to 5 inches fwd LCG			
94	Hydrostatic Roll -5lbs to Port			LMSR/T-C Tandem	Tandem - Stem Ramp	75 inches to 5 inches fwd LCG			
95	Zero	no wt		LMSR/T-C Tandem	Tandem - Stem Ramp				
96	ydrostatic Roll - 5lbs to Stbd			LMSR/T-C Tandem	Tandem - Stem Ramp				
97	Inovia chk			LMSR/T-C Tandem	Tandem - Stem Ramp				
98	Zero			LMSR/T-C Tandem	Tandem - Stem Ramp	off			New Q cal
99	Zero		0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%			
100	36	1.3	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		
101	46	1.3	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		
102	Zero After Lunch		0	LMSR/T-C Tandem	Tandem - Stem Ramp	off			collected at steps
103	Zero at Mid Basin		0	LMSR/T-C Tandem	Tandem - Stem Ramp	off			
104	Zero at Mid Basin		0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%			collected at mid basin
105	36	1.3	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
106	46	1.3	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
107	35	1.2	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
108	35	1.2	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	0.61	collected at mid basin
109	45	1.2	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	0.61	collected at mid basin
110	34	1.1	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
111	44	1.1	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
112	33	1	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
113	33	1	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
114	43	1	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
115	32	0.9	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin
116	42	0.9	4	LMSR/T-C Tendem	Tandem - Stem Ramp	100%	200		collected at mid besin
117	31	0.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin HBM Carr Spd bad
118	41	0.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin HBM Carr Spd bad
119	30	0.7	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		HBM Carr Spd bed
120	40	0.7	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		HBM Carr Spd bad
121	Zero at Mid Basin		0		Tandem - Stem Ramp	off			HBM Carr Spd bad
122	Zero at Mid Basin		0		Tandem - Stem Ramp	100%			HBM Carr Spd bad
123	29	0.6	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin HBM Carr Spd bad
124	39	0.6	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid besin HBM Carr Spd bad
125	28	0.5	0	LMSR/T-C Tendem	Tandem - Stem Ramp	100%	200		collected at mid basin HBM Carr Spd bad
126	38	0.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200		collected at mid basin HBM Carr Spd bad
127	48	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.147	SS3 HBM Cerr Spd bad
128	51	SS3/7.5	4	LMSR/T-C Tendem	Tandem - Stem Ramp	100%	200	1.147	SS3 HBM Carr Spd bad
129	51	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.147	SS3 HBM Carr Spd bad
130	81	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.147	SS3 HBM Carr Spd bad

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
131	84	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.147	SS3 HBM Carr Spd bad
132	84	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.147	SS3 HBM Carr Spd bad
133	60	SS4 /8.8	0	NG	Tandem - Stem Ramp	100%	200		stopped-NG-lag time too long
134	60	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
135	63	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
136	64	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
137	65	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
138	66	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
139	67	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
140	68	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
141	69	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
142	70	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
143	71	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
144	72	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	2.45	SS4 HBM Carr Spd bad
145	Zero After Lunch		0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200		Zero at Mid Basin
146	93	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	2.45	no bridge wave data
147	105	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	off	200	2.45	SS4 HBM Carr Spd bad
148	93	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	2.45	SS4 HBM Carr Spd bad
149	96	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	2.45	SS4 HBM Carr Spd bad
150	96	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	2.45	SS4 HBM Carr Spd bad
151	108	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	off	200	2.45	SS4 HBM Carr Spd bad
152	108	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	off	200	2.45	SS4 HBM Carr Spd bad
153	75	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.63	SS3-BiModal HBM Carr Spd bad
154	75	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.63	SS3-BiModal HBM Carr Spd bad
155	78	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.63	SS3-BiModal HBM Carr Spd bad
156	78	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	200	1.63	SS3-BiModal HBM Carr Spd bad
157	99	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.63	SS3-BiModal HBM Carr Spd bad
158	102	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.63	SS3-BiModal HBM Carr Spd bad
159	102	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	200	1.63	SS3-BiModal HBM Carr Spd bad
160	74	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.63	SS3-BiModal HBM Carr Spd bad
161	98	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.63	SS3-BiModal HBM Carr Spd bad
162	101	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.63	SS3-BiModal HBM Carr Spd bad
163	101	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.63	SS3-BiModal HBM Carr Spd bad
164	77	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.63	SS3-BiModal HBM Carr Spd bad
165	77	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.63	SS3-BiModal HBM Carr Spd bad
166	47	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.147	SS3 Waves high-will repeat
167	47	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.147	SS3
168	80	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.147	SS3
169	83	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.147	SS3
170	83	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	1.147	SS3

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
171	50	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.147	SS3 Carr Spd ok
172	BOS Zero at Steps		0	LMSR/T-C Tandem	Tandem - Stem Ramp	off	180	1.147	Zero off Cushion
173	Zero		0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%			Zero 100% Cush
174	Zero		0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%			Zero 50% Cush
175	50	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	1.147	SS3
176	59	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	2.45	SS4
177	92	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	2.45	SS4
178	104	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	off	180	2.45	SS4
179	62	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	2.45	SS4
180	62	SS4 /8.8	4	NG	Tandem - Stem Ramp	100%	180	2.45	SS4 Carr stopped early
181	62	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	180	2.45	SS4
182	95	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	2.45	SS4
183	95	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	180	2.45	SS4
184	107	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	off	180	2.45	SS4
185	107	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	off	180	2.45	SS4
186	49	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.147	SS3
187	82	SS3/7.5	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.147	SS3
188	85	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.147	SS3
189	85	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.147	SS3
190	52	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.147	SS3
191	52	SS3/7.5	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.147	SS3
192	76	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.63	SS3-BiModal
193	100	Bi-Modal	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.63	SS3-BiModal
194	103	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.63	SS3-BiModal
195	103	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	1.63	SS3-BiModal
196	79	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.63	SS3-BiModal
197	79	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.63	SS3-BiModal
198	79	Bi-Modal	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	1.63	SS3-BiModal
199	Zero After Lunch					100%			Zero -Steps
200	Zero					50%			Zero -Steps
201	Zero					off			Zero -Steps
202	Zero					off			Zero-Mid-Besin
203	Zero					50%			Zero-Mid-Basin
204	Zero					100%			Zero-Mid-Basin
205	61	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	2.45	SS4
206	94	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	2.45	SS4
207	106	SS4 /8.8	0	LMSR/T-C Tandem	Tandem - Stem Ramp	off	210	2.45	SS4
208	73	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	2.45	SS4
209	73	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	100%	210	2.45	SS4
210	97	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stem Ramp	50%	210	2.45	SS4

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
211	97	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	210	2.45	SS4
212	109	SS4 /8.8	4	NG	Tandem - Stern Ramp	off	210	2.45	SS4 No bridge wave data
213	109	test	4	NG	Tandem - Stern Ramp	off	210	2.45	SS4 HBM computer err
214	109	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	off	210	2.45	SS4 Carr stopped early
215	109	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	off	210	2.45	SS4 Water on deck & Fx maxed at 130lb
216	109	SS4 /8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	off	210	2.45	SS4 Stern Lobe Press offset- fixed after
217	Zero at Mid Basin			LMSR/T-C Tandem	Tandem - Stern Ramp	100%			Zero at Mid Basin
218	55	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	210	1.629	SS3 No HBM data -repeat run
219	88	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	210	1.629	SS3
220	91	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	210	1.629	SS3
221	91	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	210	1.629	SS3
222	58	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	210	1.629	SS3
223	58	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	210	1.629	SS3
224	54	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	1.629	SS3
225	87	SS3/10	0	NG	Tandem - Stern Ramp	50%	200	1.629	SS3 Carr Stopped early
226	87	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	200	1.629	SS3
227	90	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	200	1.629	SS3
228	90	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	200	1.629	SS3
229	57	SS3/10	4	NG	Tandem - Stern Ramp	100%	200	1.629	NG Carr Stopped early
230	57	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	1.629	SS3
231	57	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	1.629	SS3
232	BOS Zero at Steps					off	180		Zero at Steps
233	test					test			test-BRPM cal-big reg wvs
234	Zero					50%			Zero
235	Zero					100%			Zero
236	Zero at Mid Basin					100%			Zero at Mid Basin
237	Zero					50%			Zero at Mid Basin
238	Zero					off			Zero at Mid Basin
239	86	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	180	1.629	SS3
240	53	SS3/10	0	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	1.629	SS3
241	56	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	1.629	SS3
242	56	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	1.629	SS3
243	89	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	180	1.629	
244	89	SS3/10	4	LMSR/T-C Tandem	Tandem - Stern Ramp	50%	180	1.629	
245	Zero at Stairs		0		Tandem - Stern Ramp + Tank	off			
246	Zero		0		Tandem - Stern Ramp + Tank	50			
247	Zero		0		Tandem - Stern Ramp + Tank	100			
248	Zero at Mid Basin		0		Tandem - Stern Ramp + Tank	100			
249	Zero		0		Tandem - Stern Ramp + Tank	50			
250	Zero		0		Tandem - Stern Ramp + Tank	off			

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
251	140	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.629	SS3
252	116	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.629	SS3
253	119	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.629	SS3
254	119	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.629	SS3
255	119	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.629	SS3
256	143	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.629	SS3
257	143	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.629	SS3
258	141	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.629	SS3
259	117	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.629	SS3
260	120	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.629	SS3 No bridge wave data recorded
261	Zero at Stairs		0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.629	
262	Zero		0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%			
263	Zero		0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%			
264	120	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.629	SS3
265	120	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.629	SS3
266	NG	SS3/10	4	NG	Tandem - Stern Ramp + Tank				SS3 Carr stopped early
267	144	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.629	SS3
268	144	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.629	SS3
269	142	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.629	SS3
270	118	SS3/10	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.629	SS3
271	121	SS3/10	4	NG	Tandem - Stern Ramp + Tank	100%	210	1.629	SS3 Carr stopped early
272	121	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.629	SS3
273	121	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.629	SS3
274	145	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.629	SS3
275	145	SS3/10	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.629	SS3
276	112	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.147	SS3
277	136	SS3/7.5	0	NG	Tandem - Stern Ramp + Tank	50%	210	1.147	SS3
278	136	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.147	SS3
279	139	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.147	SS3
280	139	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.147	SS3
281	115	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.147	SS3
282	115	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.147	SS3
283	130	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.63	SS3-BiModal
284	154	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.63	SS3-BiModal
285	157	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.63	SS3-BiModal No bridge wave data
286	157	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.63	SS3-BiModal No bridge wave data
287	157	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.63	SS3-BiModal
288	157	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	1.63	SS3-BiModal
289	133	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.63	SS3-BiModal
290	133	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	1.63	SS3-BiModal

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	Inch	
291	129	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.63	SS3-BiModal
292	153	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal
293	156	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal Carr stopped early
294	156	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal Carr stopped early
295	156	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal
296	156	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal Carr stopped early
297	156	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.63	SS3-BiModal
298	BOS Zero at Steps					off			
299	Zero					50%			
300	Zero					100%			
301	Zero at Mid Basin					100%			
302	Zero					50%			
303	Zero					off			
304	111	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.147	SS3
305	135	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.147	SS3
306	138	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.147	SS3
307	138	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	1.147	SS3
308	114	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.147	SS3
309	114	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.147	SS3
310	Zero at Stairs					off			zero
311	Zero					50%			zero
312	Zero					100%			zero
313	132	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.63	SS3-BiModal No bridge wave data
314	132	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.63	SS3-BiModal
315	132	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	1.63	SS3-BiModal
316	128	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.63	SS3-BiModal
317	152	Bi-Modal	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.63	SS3-BiModal
318	155	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.63	SS3-BiModal
319	155	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.63	SS3-BiModal
320	131	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.63	SS3-BiModal
321	131	Bi-Modal	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.63	SS3-BiModal
322	110	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.147	SS3
323	134	SS3/7.5	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.147	SS3
324	137	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.147	SS3 No bridge wave data recorded
325	137	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.147	SS3
326	137	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	1.147	SS3
327	113	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.147	SS3
328	113	SS3/7.5	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	1.147	SS3
329	BOS Zero at Steps	40246		LMSR/T-C Tandem +Tank		off			Zero
330	Zero			LMSR/T-C Tandem +Tank		off			Zero

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
331	Zero			LMSR/T-C Tandem +Tank		50%			Zero
332	Zero			LMSR/T-C Tandem +Tank		100%			Zero
333	Zero at Mid Basin			LMSR/T-C Tandem +Tank		100%			Zero
334	Zero Zero			LMSR/T-C Tandem +Tank		50%			Zero
335	Zero		0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	off			Zero
336	122	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	2.45	SS4
337	146	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	2.45	SS4
338	125	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	2.45	SS4
339	125	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	2.45	SS4
340	149	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	2.45	SS4
341	149	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	180	2.45	SS4
342	474	Hi SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	3.25	Hi SS4
343	474	Hi SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	3.25	Hi SS4 Waves low- will repeat
344	476	Hi SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	3.25	Hi SS4
345	476	Hi SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	180	3.25	Hi SS4
346	123	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	2.45	SS4
347	147	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	**50%**	200	2.45	SS4
348	150	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	2.45	SS4
349	150	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	200	2.45	SS4
350	126	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	2.45	SS4
351	126	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	2.45	SS4
352	475	Hi SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	3.25	Hi SS4
353	477	Hi SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	3.25	Hi SS4
354	477	Hi SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	200	3.25	Hi SS4
355	124	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	2.45	SS4
356	148	SS4/8.8	0	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	2.45	SS4
357	151	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	2.45	SS4
358	151	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	50%	210	2.45	SS4
359	127	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	2.45	SS4
360	127	SS4/8.8	4	LMSR/T-C Tandem +Tank	Tandem - Stern Ramp + Tank	100%	210	2.45	SS4 Small splash -- water on deck
361	471	Hi SS4/8.8	0	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	3.25	Hi SS4
362	473	Hi SS4/8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	3.25	Hi SS4
363	473	Hi SS4/8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	200	3.25	Hi SS4
364	470	Hi SS4/8.8	0	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	3.25	Hi SS4
365	472	Hi SS4/8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	3.25	Hi SS4
366	472	Hi SS4/8.8	4	LMSR/T-C Tandem	Tandem - Stern Ramp	100%	180	3.25	Hi SS4
367		calm		load cell checks					
368		calm		load cell checks					
369		calm		load cell checks					
370		calm		load cell checks					

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010

Run	Matrix #	SeaCond- Omega FS	Speed FS kts	Vehicle type	Test type	Cushion	Rel Wv Hdng 180 head	WH Target inch	Comments
371		calm		load cell checks					
372		calm		load cell checks					
373		calm		load cell checks					
374		calm		load cell checks					
375		calm		load cell checks					
376		calm		load cell checks					
377		calm		load cell checks					
378		calm		load cell checks					
379		calm		load cell checks					
380		calm		load cell checks					
381		calm		load cell checks					
382		calm		load cell checks					
383		calm		load cell checks					
384		calm		load cell checks					
385		calm		load cell checks					
386		calm		load cell checks					
387		calm		load cell checks					
388		calm		load cell checks					
389		calm		load cell checks					
390		calm		load cell checks					
391		calm		load cell checks					
392		calm		load cell checks					
393		calm		load cell checks					
394		calm		load cell checks					
395		calm		load cell checks					
396		calm		load cell checks					
397		calm		load cell checks					
398		calm		load cell checks					
399		calm		load cell checks					
400		calm		load cell checks					
401		calm		load cell checks					
402		calm		load cell checks					
403		calm		load cell checks					
404		calm		load cell checks					
405		calm		load cell checks					
406		calm		load cell checks					
407		calm		load cell checks					
408		calm		load cell checks					
409		calm		load cell checks					
410		calm		load cell checks					

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	Inch	
411		calm		load cell checks					
412		calm		load cell checks					
413		calm		load cell checks					
414		calm		load cell checks					
415		calm		load cell checks					
416		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
417		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
418		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
419		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
420		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
421		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
422		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
423		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
424		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
425		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
426		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
427		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
428		calm		LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load		180		
429	BOS Zero at Steps		0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	off			
430	Zero			LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%			
431	Zero			LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%			
432	Zero at Mid Basin			LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	off			
433	Zero			LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%			
434	Zero			LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%			
435	158	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.147	
436	182	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.147	
437	185	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.147	
438	185	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.147	
439	161	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.147	
440	161	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.147	
441	176	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.63	SS3-BiModal
442	200	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.63	SS3-BiModal
443	203	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.69	SS3-BiModal
444	203	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	1.69	SS3-BiModal
445	179	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.69	SS3-BiModal
446	179	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	1.69	SS3-BiModal
447	170	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	100%	180	2.45	SS4
448	194	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	2.45	SS4
449	197	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	2.45	SS4
450	197	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Lo	Tandem - Stern Ramp + T-C Full Load	50%	180	2.45	SS4

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									After 471-RPM power su
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
451	173	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	2.45	SS4
452	173	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	2.45	SS4
453	478	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	Hi SS4
454	480	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	Hi SS4
455	480	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	
456	159	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.147	SS3 Aft Lobe Press not right- checking ok now
457	159	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.147	SS3
458	183	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.147	SS3
459	162	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.147	SS3
460	162	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.147	SS3
461	186	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.147	SS3
462	186	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.147	SS3
463	BOS Zero at Steps	40248	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	off			
464	Zero			LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%			
465	Zero			LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%			
466	Zero at Mid Basin			LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%			
467	177	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.69	SS3-BiModal
468	201	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.69	SS3-BiModal
469	204	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.69	SS3-BiModal
470	204	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.69	SS3-BiModal Carr stopped early
471	204	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.69	SS3-BiModal
472	180	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.69	SS3-BiModal
473	180	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.69	SS3-BiModal
474	171	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	2.45	SS4
475	195	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	2.45	SS4
476	198	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	2.45	SS4
477	198	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	2.45	SS4
478	174	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	2.45	SS4
479	174	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	2.45	SS4
480	479	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4
481	481	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4
482	481	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4
483	165	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.629	SS3
484	189	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.629	SS3
485	192	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.629	SS3
486	192	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	200	1.629	SS3
487	168	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.629	SS3 Carr stopped early
488	168	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.629	SS3
489	168	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.629	SS3 Carr stopped early
490	168	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	1.629	SS3

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
491	495	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4 Severe Motions
492	497	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4 Carr stopped early
493	497	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4 Severe Motions
494	497	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	200	3.25	Hi SS4 Severe Motions
495	164	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	1.629	SS3
496	188	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	180	1.629	SS3
497	191	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	180	1.629	SS3
498	191	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	50%	180	1.629	SS3
499	167	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	1.629	SS3
500	167	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	1.629	SS3
501	494	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	Hi SS4
502	496	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	Hi SS4
503	496	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp + T-C Full Load	100%	180	3.25	Hi SS4
504			0	LMSR/T-C Tandem + T-C Full Load	CW Zero – 100% Cush, 210 Deg @ mi	100			
505			0	LMSR/T-C Tandem + T-C Full Load	CW Zero – 50% Cush, 210 Deg @ mid	50			
506			0	LMSR/T-C Tandem + T-C Full Load	CW Zero – Off Cush, 210 Deg @ middl	0			
507	166	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
508	190	SS3/10	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
509	193	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	NO WAVE DATA	50	210	1.629	No Wave Data
510	193	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
511	193	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
512	169	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
513	169	SS3/10	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
514	160	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.15	
515	184	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.15	
516	187	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.15	
517	187	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.15	
518	163	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.15	
519	163	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.15	
520	178	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
521	202	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
522	205	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	Carriage Stopped Early
523	205	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
524	205	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	1.629	
525	181	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
526	181	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	1.629	
527	"Bonus"	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	3.25	
528	"Bonus"	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	3.25	
529	"Bonus"	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	3.25	
530	"Bonus"	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	3.25	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
531				LMSR/T-C Tandem + T-C Full Load	CW Zero 100% @ steps	100			
532				LMSR/T-C Tandem + T-C Full Load	CW Zero 50% @ steps	50			
533				LMSR/T-C Tandem + T-C Full Load	CW Zero 50% @ middle	50			
534				LMSR/T-C Tandem + T-C Full Load	CW Zero 100% @ middle	100			
535	196	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	2.45	
536	172	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	2.45	
537	175	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	2.45	
538	175	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	100	210	2.45	
539	199	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	2.45	
540	199	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load	Tandem - Stern Ramp	50	210	2.45	
541				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 50% @ middle	100			
542				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 100% @ middle	50			
543	232	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.147	
544	208	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	210	1.147	
545	211	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	210	1.147	
546	211	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	210	1.147	
547	235	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Bad Run -- Carriage Stops	50	210	1.147	Carriage stopped abruptly during run
548	235	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.147	
549	235	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.147	
550				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero Off Cushion @ steps	0			
551				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero Off Cushion @ steps				
552				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero Off Cushion @ steps				
553				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 50% Cushion @ steps				
554				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 100% Cushion @ steps				Prior to this run, gauges were cleaned
555				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 50% Cushion @ steps				
556				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC roll decay	100			
557				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC pitch decay	100			
558				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC pitch decay	100			
559				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC yaw decay	100			
560				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC heave decay	100			
561				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC heave decay	50			
562				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC yaw decay	50			
563				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC pitch decay	50			
564				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	TC roll decay	50			
565				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 100% Cushion @ middle	50			
566				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 100% Cushion @ middle	100			
567	226	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	210	1.629	
568	250	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.629	
569	253	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.629	
570	253	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	210	1.629	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
571	229	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	210	1.629	
572	229	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	210	1.629	Bad Run, camage stopped
573	229	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	210	1.629	
574	220	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	210	2.45	
575	244	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	210	2.45	
576	247	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	210	2.45	
577	247	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	210	2.45	Bad Run, no wave data
578	247	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	210	2.45	
579	223	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	210	2.45	
580	223	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	210	2.45	
581	219	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	2.45	Bad Run, no wave data
582	219	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	2.45	
583	243	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	2.45	
584	246	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	2.45	
585	246	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	2.45	Water on port bow
586	222	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	200	2.45	Bad Run, camage stopped
587	222	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	2.45	
588	222	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	2.45	
589				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 50% Cushion @ middle	50			
590				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero 100% Cushion @ middle	100			
591	207	SS3/7/5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run	100	200	1.147	Bad Run, Data collects not started at same time
592	207	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.147	
593	231	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.147	
594	234	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	50	200	1.147	Bad Run, camage stopped
595	234	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.147	
596	234	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.147	
597	210	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.147	
598	210	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	200	1.147	Bad Run, camage stopped
599	210	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	200	1.147	Bad Run, camage stopped
600	210	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.147	
601	225	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.63	
602	249	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.63	
603	252	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.63	
604	252	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	200	1.63	
605	228	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	200	1.63	Bad Run, camage stopped
606	228	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.63	
607	228	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run, Camage stops	100	200	1.63	Bad Run, camage stopped
608	228	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	1.63	
609	491	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	3.25	Bridge sonic collected AFTER data collect began, collect time increased
610	493	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	3.25	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	Inch	
611	493	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	BAD Run. Camage stops	100	200	3.25	Bad Run, camage stopped
612	493	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	200	3.25	
613				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero, off cusion @ steps	0	180		
614				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero, 100% cushion, @ steps	100	180		
615				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW zero, 50% cushion @ steps	50	180		
616				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW zero 50% cushion @ ladder	50	180		
617				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW zero 100% cushion @ ladder	100	180		
618	206	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.147	
619	230	SS3/7.5	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.147	
620	233	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.147	
621	233	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.147	
622	209	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.147	
623	209	SS3/7.5	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.147	
624	224	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.63	
625	248	Bi-Modal	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
626	251	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
627	251	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
628	227	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.63	
629	227	Bi-Modal	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.63	
630	218	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	2.45	
631	242	SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	2.45	
632	245	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	2.45	
633	245	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	2.45	No wave data
634	245	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	2.45	
635	221	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	2.45	camage stopped
636	221	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	2.45	camage stopped
637	221	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	2.45	
638	221	SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	2.45	
639	490	Hi SS4/8.8	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	3.25	
640	492	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	3.25	camage stopped
641	492	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	3.25	
642	492	Hi SS4/8.8	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	3.25	
643				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW zero, 50% cushion @ steps	50			movement on the bridge
644				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW zero, 50% cushion @ steps	50			
645				LMSR/T-C Tandem + T-C Full Load w/ tank on ram	CW Zero, 100% cushion, @ steps	100			
646	212	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.63	
647	236	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
648	239	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
649	239	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	50	180	1.63	
650	215	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stem Ramp w/ Tank	100	180	1.63	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Targat	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
651	215	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	1.63	camage stopped
652	215	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	1.63	
653	498	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	
654	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	
655	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	camage stopped
656	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	camage stopped
657	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	camage stopped AND no waves data!
658	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	camage stopped
659	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	
660	499	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	3.258	
661	501	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	3.258	
662	501	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	3.258	camage stopped
663	501	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	3.258	
664					CW Zero Off Cushion @ steps	off			
665					CW Zero 100% Cushion @ steps	100			
666					CW Zero 50% Cushion @ steps	50			
667					CW Zero 50% Cushion @ middle	50			
668					CW Zero 100% Cushion @ middle	100			
669	213	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
670	237	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
671	240	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
672	240	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
673	216	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
674	216	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
675	214	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
676	238	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
677	241	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
678	241	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	200	1.629	
679	217	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
680	217	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	200	1.629	
681	212	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	1.63	repeat run 646
682	236	SS3/10	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	180	1.63	repeat run 647
683	239	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	180	1.63	repeat run 648
684	239	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	50	180	1.63	repeat run 649
685	215	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	1.63	repeat run 650
686	215	SS3/10	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	1.63	repeat run 652
687	498	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	rapeat run 653
688	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	repeat run 654
689	500	SS4/11.3	4	LMSR/T-C Tandam + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	repeat run 659 Bad Run No Wave data
690	500	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ram	Tandem - Stern Ramp w/ Tank	100	180	3.258	repeat 689

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeeCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
691	499	SS4/11.3	0	LMSR/T-C Tandem + T-C Full Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	repeat 660
692	501	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	repeat 661
693	501	SS4/11.3	4	LMSR/T-C Tandem + T-C Full Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	repeat 663
694				LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	CW Zero 50% Cushion @ middle	50			
695				LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	CW Zero 100% Cushion @ middle	100			
696	483	SS4/11.3	0	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	
697	485	SS4/11.3	4	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	
698	485	SS4/11.3	4	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	200	3.258	
699	484	SS4/11.3	4	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	180	3.258	
700	484	SS4/11.3	4	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	180	3.258	
701	482	SS4/11.3	0	LMSR/T-C Tandem + T-CNo Load w/ tank on ramp	Tandem - Stem Ramp w/ Tank	100	180	3.258	
702	478	SS4/11.3	0	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	180	3.258	
703	480	SS4/11.3	4	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	180	3.258	
704	480	SS4/11.3	4	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	180	3.258	
705	481	SS4/11.3	4	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	200	3.258	
706	481	SS4/11.3	4	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	200	3.258	
707	479	SS4/11.3	0	LMSR/T-C Tandem + T-C No Load	Tandem - Stem Ramp w/ Tank	100	200	3.258	
708				LMSR/T-C Tandem + T-C No Load	CW Zero 100% Cushion @ middle	100			
709				LMSR/T-C Tandem + T-C No Load	CW Zero 50% Cushion @ middle	50			
710				LMSR/T-C Tandem + T-C No Load	CW Zero Off Cushion @ middle	0			
711				Side-By-Side	Channel Checkout				
712				Side-By-Side	CW Zero, Off cushion @ steps	0			180 Deg
713				Side-By-Side	CW Zero, 50% cushion @ steps	50			
714				Side-By-Side	CW Zero, 100% cushion @ steps	100			
715				Side-By-Side	CW Zero, 100% cushion @ middle	100			
716				Side-By-Side	CW Zero, 50% cushion @ middle	50			
717	518	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	3.258	SS4 Tm = 11.3 sec performed 1st to see if ramp hits bow of T-Craft
718	520	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	3.258	
719	520	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	3.258	
720	521	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	3.258	
721	521	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	3.258	
722	519	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	3.258	
723	261	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
724	264	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
725	264	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	transverse seal pressure lost during run. Decision was made to continue testing without trans seal pressure until stopping point is available
726	265	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	(trans seal pressure remains unavailable)
727	265	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	(trans seal pressure remains unavailable)
728	262	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	(trans seal pressure remains unavailable)
729	263	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	(trans seal pressure remains unavailable)
730	263	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	(trans seal pressure remains unavailable)

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
731	260	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	(trans seal pressure remains unavailable)
732	254	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	transverse seal pressure fixed prior to run 732
733	257	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	Q Roll_tc looks very hashy
734	257	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	Q Roll_tc looks very hashy; run trimmed b/c collect was not stopped before carriage slowed
735	275	Bi-Modal	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
736	275	Bi-Modal	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
737	272	Bi-Modal	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
738	738	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
739	269	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
740	269	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
741	267	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
742	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
743	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	Carriage Stops Abruptly
744	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
745	255	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
746	258	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
747	258	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
748	273	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
749	276	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
750	276	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
751	274	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	
752	277	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	
753	277	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.629	
754	268	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
755	271	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
756	271	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
757				Side-By-Side	CW Zero 100% Cushion @ steps	100			
758				Side-By-Side	CW Zero Off Cushion @ steps	0			
759				Side-By-Side	CW Zero Off Cushion @ steps				
760				Side-By-Side	CW Zero 50% Cushion @ steps				
761				Side-By-Side	CW Zero 100% Cushion @ steps				
762				Side-By-Side	LMSR roll, port down	100			
763				Side-By-Side	LMSR pitch, stem down	100			
764				Side-By-Side	LMSR Yaw, stem stbd	100			Qsys failed
765				Side-By-Side	CW Zero 100% Cushion @ steps				
766				Side-By-Side	CW Zero 50% Cushion @ steps				
767				Side-By-Side	CW Zero Off Cushion @ steps				
768				Side-By-Side	LMSR Yaw, stem stbd	100			
769				Side-By-Side	LMSR heave, down	100			
770				Side-By-Side	TC roll, stbd down	100			

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SesCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
771	260	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	(trans seal pressure remains unavailable)
772	254	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	transverse seal pressure fixed prior to run 732
773	257	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	Q Roll_tc looks very hashy
774	257	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.15	Q Roll_tc looks very hashy; run trimmed b/c collect was not stopped before carriage slowed
775	275	Bi-Modal	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
776	275	Bi-Modal	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
777	272	Bi-Modal	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	1.629	
778	738	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
779	269	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
780	269	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	180	2.45	
781	267	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
782	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
783	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	Carriage Stops Abruptly
784	270	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
785	255	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
786	258	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
787	258	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.15	
788	273	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.629	
789	276	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.829	
790	278	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	1.829	
791	274	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.829	
792	277	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.829	
793	277	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	210	1.829	
794	268	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
795	271	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
796	271	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp w/ No Load	100	200	2.45	
797				Side-By-Side	CW Zero 100% Cushion @ steps	100			
798				Side-By-Side	CW Zero Off Cushion @ steps	0			
799				Side-By-Side	CW Zero Off Cushion @ steps				
800				Side-By-Side	CW Zero 50% Cushion @ steps				
801				Side-By-Side	CW Zero 100% Cushion @ steps				
802				Side-By-Side	LMSR roll, port down	100			
803				Side-By-Side	LMSR pitch, stem down	100			
804				Side-By-Side	LMSR Yaw, stem stbd	100			Qsys failed
805				Side-By-Side	CW Zero 100% Cushion @ steps				
806				Side-By-Side	CW Zero 50% Cushion @ steps				
807				Side-By-Side	CW Zero Off Cushion @ steps				
808				Side-By-Side	LMSR Yaw, stem stbd	100			
809				Side-By-Side	LMSR heave, down	100			
810				Side-By-Side	TC roll, stbd down	100			

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
811				Side-By-Side	LMSR Yaw, stern stbd	100			
812				Side-By-Side	TC roll, stbd down	100			
813				Side-By-Side	TC pitch, bow down	100			
814				Side-By-Side	TC heave, down	100			Bad Run; Qsys failure
815				Side-By-Side	TC heave, down	100			
816				Side-By-Side	TC heave, down	100			
817				Side-By-Side	TC yaw, bow stbd	100			
818	282	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.15	
819	282	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.15	Bad run; no wave data
820	282	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.15	
821	300	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.629	
822	300	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.629	
823	297	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.629	Bad run
824	297	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	1.629	
825	291	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	2.45	
826	294	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	2.45	
827	294	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	200	2.45	
828					CW Zero, Off cushion @ steps	0			
829					CW Zero, 50% cushion @ steps	50			
830					CW Zero, 100% cushion @ steps	100			
831	281	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.15	
832	281	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.15	
833	278	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.15	
834	296	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
835	299	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
836	299	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
837	290	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	2.45	
838	293	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	2.45	
839	293	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	2.45	
840	287	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
841	287	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
842	284	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	1.629	
843	522	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	3.258	
844	524	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	3.258	Noticed that the T-Craft Body is occasionally dropping out during run (3 times?, very short duration)
845	524	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(No Load w/tank on ram	100	180	3.258	
846					CW Zero, 100% cushion @ steps	100			
847	335	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ra	100	180	1.629	No Good b/c Wave Spectrum does not look good
848	335	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ra	100	180	1.629	
849	335	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ra	100	180	1.629	
850	332	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ra	100	180	1.629	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	Inch	
851	530	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	3.258	
852	532	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	3.258	
853	532	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	3.258	Noticed an occasion flicker in Q-sys T-Craft body
854				Side-By-Side	LMSR roll, port down	100			
855				Side-By-Side	LMSR heave, down	100			
856				Side-By-Side	LMSR pitch, stern down	100			
857				Side-By-Side	LMSR pitch, stern down	100			
858				Side-By-Side	LMSR Yaw, stern stbd	100			
859				Side-By-Side	TC roll, stbd down	100			
860				Side-By-Side	TC pitch, bow down	100			
861				Side-By-Side	TC heave, down	100			
862				Side-By-Side	TC heave, down	100			Qsys delay
863				Side-By-Side	TC heave, down	100			
864				Side-By-Side	TC yaw, bow stbd	100			
865				Side-By-Side	TC yaw, bow stbd	100			
866				Side-By-Side	CW Zero, 100% cushion @ steps		180		
867				Side-By-Side	CW Zero, Off cushion @ steps		180		
868				Side-By-Side	CW Zero, Off cushion @ steps		180		
869				Side-By-Side	CW Zero, 100% cushion @ steps		180		
870				Side-By-Side	CW Zero, 100% cushion @ middle	100			
871	326	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.15	
872	329	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.15	
873	329	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.15	
874	344	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.629	
875	347	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.629	
876	347	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	1.629	
877	338	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	2.45	
878	341	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	2.45	
879	341	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	180	2.45	
880	342	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	2.45	
881	342	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	2.45	
882	339	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	2.45	
883	327	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.15	
884	330	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.15	
885	330	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.15	
886	345	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
887	348	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
888	348	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
889	333	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
890	336	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
891	336	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	1.629	
892	531	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	3.258	
893	533	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	3.258	
894	533	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	200	3.258	
895				Side-By-Side	CW Zero, 100% cushion @ steps	100	210		
896				Side-By-Side	CW Zero, 100% cushion @ middle	100	210		
897	334	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
898	337	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
899	337	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
900	328	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.15	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
901	331	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.15	
902	331	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.15	
903	346	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
904	349	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
905	349	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	1.629	
906	340	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	2.45	
907	343	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	2.45	
908	343	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	2.45	Bad run, carriage stopped
909	343	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load w/tank on ran	100	210	2.45	
910				Side-By-Side	CW Zero, 100% cushion @ steps	100	210		
911				Side-By-Side	CW Zero, Off cushion @ steps	0	210		
912				Side-By-Side	CW Zero, Off cushion @ steps	0	210		
913				Side-By-Side	CW Zero, 50% cushion @ steps	50	210		Cushion pressure low
914				Side-By-Side	CW Zero, 100% cushion @ steps	100	210		Cushion pressure low
915				Side-By-Side	CW Zero, 100% cushion @ steps	100	210		
916				Side-By-Side	CW Zero, 50% cushion @ steps	50	210		
917				Side-By-Side	LMSR roll, port down	100			
918				Side-By-Side	LMSR heave, down	100			
919				Side-By-Side	LMSR pitch, stern down	100			
920				Side-By-Side	LMSR Yaw, stern stbd	100			
921				Side-By-Side	TC roll, stbd down	100			
922				Side-By-Side	TC heave, down	100			
923				Side-By-Side	TC pitch, bow down	100			
924				Side-By-Side	TC yaw, bow stbd	100			
925	Zero At Ladder	40266		Side-By-Side	CW Zero, 100% cushion @ ladder	100	210		BOS Zero
926	304	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.15	
927	307	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.15	
928	307	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.15	
929	325	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	
930	325	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	
931	322	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	
932	316	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	2.45	rich back
933	319	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	2.45	Bad run, no wave data ,run aborted early
934	319	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	2.45	
935	319	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	2.45	
936	310	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	repeated 936 because of run time err on HBM computer- no data written first time- this is second attempt- good
937	313	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	
938	313	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	210	1.629	
939	Zero After Lunch	steps							
940	zero	ladder							

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
941	309	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
942	312	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
943	312	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
944	527	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	3.258	LMSR & T-C moving
945	529	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	3.258	Lots of Rel Motion -Pitch
946	529	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	3.258	
947	306	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.15	
948	306	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.15	
949	303	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.15	
950	321	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
951	324	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	Bad run, carriage stopped
952	324	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
953	324	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	1.629	
954	315	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	2.45	
955	BOS Zero at Steps								Noticed .TXT files have dropped comment in Line 12-Comment is recorded in TABLE file successfully
956									
957									
958	318	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	2.45	
959	318	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	200	2.45	
960	314	SS4/8.8	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	2.45	lots of pitch rel mo
961	317	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	2.45	
962	317	SS4/8.8	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	2.45	
963	302	SS3/7.5	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.15	
964	305	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.15	
965	305	SS3/7.5	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.15	
966	320	SS3/Bi-Moda	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	
967	323	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	
968	323	SS3/Bi-Moda	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	LMSR pitching-T-C in sync
969	308	SS3/10	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	both pitching
970	311	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	
971	311	SS3/10	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	1.629	
972	528	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	3.258	Bad run, no wave data ,run aborted early
973	528	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	3.258	
974	528	SS4/11.3	4	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	3.258	
975	526	SS4/11.3	0	Side-By-Side	Side-By-Side - Long Ramp(Full Load)	100	180	3.258	very rough
976	BOS Zero at Steps					off			
977	BOS Zero at Steps					100			
978	Ch Chk-Sliding Ramp								Brian Adding Hinged Ramp Channels to HBM
979	Ch Chk-Sliding Ramp								Brian Added Hinged Ramp Channels to HBM
980	Ch Chk-Hinged Ramp Channels in TABLE								BrianAdded Hinged Ramp Channels-chkng table

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
981	Zero			LMSR & T-C Hinged-Tandem	Hinged Ramp -No Load	100			Zero
982	Roll Decay				Hinged Ramp -No Load	100		Positive Rol	LMSR Stbd Down
983	Pitch Decay				Hinged Ramp -No Load	100		Negative Pitc	LMSR Stern Down
984	Yaw Decay				Hinged Ramp -No Load	100		Negative Yav	Pushed LMSR Stern to Port
985	Surge Chk				Hinged Ramp -No Load	100		-	Pushed LMSR Fwd from CG -BG off - will repeat
986	Surge Chk				Hinged Ramp -No Load	100		Negative Dar	Pushed LMSR Fwd from CG -BG off - will repeat
987	Sway Chk				Hinged Ramp -No Load	100		Negative Swa	Pushed LMSR to Stbd at cg- saw Q sway go out of range-need to set Q offsets
988	Zero				Hinged Ramp -No Load	100			Zero at steps
989	Pitch Decay				Hinged Ramp -No Load				
990					Hinged Ramp -No Load				
991					Hinged Ramp -No Load				
992					Hinged Ramp -No Load				
993					Hinged Ramp -No Load				
994					Hinged Ramp -No Load				
995					Hinged Ramp -No Load				
996					Hinged Ramp -No Load				
997					Hinged Ramp -No Load				
998					Hinged Ramp -No Load				
999					Hinged Ramp -No Load				
1000					Hinged Ramp -No Load				
1001					Hinged Ramp -No Load				
1002					Hinged Ramp -No Load				
1003					Hinged Ramp -No Load				
1004					Hinged Ramp -No Load				
1005					Hinged Ramp -No Load				
1006	Yaw Impact chk				Hinged Ramp -No Load				Bumped LMSR Stern to Port w punt
1007	Pitch Impact Chk				Hinged Ramp -No Load				Sharp LMSR Stern Down w stick
1008	Pitch Decay				Hinged Ramp -No Load				Slow LMSR Stern Down push-pitch decay
1009					Hinged Ramp -No Load				
1010					Hinged Ramp -No Load				
1011					Hinged Ramp -No Load				
1012					Hinged Ramp -No Load				
1013					Hinged Ramp -No Load				
1014					Hinged Ramp -No Load				
1015					Hinged Ramp -No Load				
1016					Hinged Ramp -No Load				
1017					Hinged Ramp -No Load				
1018					Hinged Ramp -No Load				
1019					Hinged Ramp -No Load				
1020					Hinged Ramp -No Load				

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Metrix #	Omega FS	FS kts	type			180 head	inch	
1021					Hinged Ramp -No Load				
1022					Hinged Ramp -No Load				
1023					Calm Water Zero, Hinged, No Load100% Cushion,	100			
1024					Calm Water Zero, Hinged, No Load100% Cushion,	100			
1025	356	SS3/10	0	LMSR/T-C Tandem	Hinged - Stern Ramp No Load	100	180	1.629	No wave data
1026	356	SS3/10	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1027	359	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1028	359	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1029	353	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.15	
1030	353	SS3/7.5	4	LMSR/T-C Tandem	Hinged - Stern Ramp No Load	100	180	1.15	Carriage stop
1031	353	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.15	
1032	350	SS3/7.5	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.15	
1033	371	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1034	371	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1035	368	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	1.629	
1036	362	SS4/8.8	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	2.45	
1037	365	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	2.45	
1038	365	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	2.45	
1039	550	SS4/11.3	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	3.258	
1040	552	SS4/11.3	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	3.258	
1041	552	SS4/11.3	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	180	3.258	
1042	357	SS3/10	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1043				LMSR/T-C Tandem	Calm Water Zero, Hinged, 100% Cushion, at ladde	100			
1044				LMSR/T-C Tandem	Pitch Decay w/ TC Foam				Gyro Off
1045				LMSR/T-C Tandem	Pitch Decay w/ TC Foam				
1046				LMSR/T-C Tandem	CW Zero Ramp Tank Test				
1047				LMSR/T-C Tandem	Pitch Decay w/ Tank on Ramp				
1048				LMSR/T-C Tandem	CW Zero w/ no ramp on nano				
1049				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs in middle of nano plate				
1050				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs stbd edge of plate				
1051				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs port edge of plate				
1052				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs fwd edge of middle plate				
1053				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs aft edge of middle plate				
1054				LMSR/T-C Tandem	Tank on Ramp, 2.00 lbs stbd-fwd edge of nano plate				
1055				LMSR/T-C Tandem	CW Zero, no load @ steps	100	200		
1056	360	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1057	360	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1058	551	SS4/11.3	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	3.258	(water level is 1/4" high causing SWH to be high)
1059	553	SS4/11.3	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	3.258	(water level is 1/4" high causing SWH to be high)
1060	553	SS4/11.3	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	3.258	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
1061	354	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.147	
1062	354	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.147	
1063	351	SS3/7.5	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.147	
1064	369	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1065	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	No Wave Data
1066	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	*Q-Sys Camera Accidentially bumped by VIP. Looks OK afterward, testing continues
1067	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1068	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1069	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1070	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1071	372	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	1.629	
1072					CW Zero @ steps	100			*Q-sys recaled prior to run
1073	366	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	2.45	
1074	366	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	2.45	
1075	363	SS4/8.8	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	200	2.45	
1076	367	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	2.45	
1077	367	SS4/8.8	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	2.45	
1078	364	SS4/8.8	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	2.45	
1079	352	SS3/7.5	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.147	
1080	355	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.147	
1081	355	SS3/7.5	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.147	
1082	370	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1083	373	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1084	373	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1085	358	SS3/10	0	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1086	361	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1087	361	SS3/10	4	LMSR/T-C Tandem	Hinged Ramp -No Load	100	210	1.629	
1088	BOS Zero at Steps	40275			CW Zero @ steps, hinged, ramp tank, 180 deg, 10	100			CW Zero @ steps, hinged, ramp tank, 180 deg, 100% cushion
1089	383	SS3/10	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	
1090	383	SS3/10	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	catman file has carriage stopping data at very end
1091	380	SS3/10	0	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	
1092	554	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	3.258	
1093	556	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	3.258	
1094	556	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	3.258	
1095	374	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.147	
1096	377	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.147	
1097	377	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.147	
1098	392	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	
1099	395	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	
1100	395	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stern Ramp - Tank on Ramp	100	180	1.629	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
1101	386	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	180	2.45	
1102	389	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	180	2.45	
1103	389	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	180	2.45	
1104	390	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	2.45	
1105	390	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	2.45	
1106	387	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	2.45	
1107				LMSR/T-C Tandem	CW Zero @ steps, hinged, ramp tank, 200 deg, 10	100			Zero after lunch
1108	375	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.147	
1109	378	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.147	Camage Stops Abrupted at end of run (at approx 120 sec), run is still considered good
1110	378	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.147	
1111	393	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1112	396	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1113	396	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	Camage Stops Abruptly
1114	396	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1115	555	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	3.258	
1116	557	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	3.258	
1117	557	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	3.258	Camage Stops Abruptly
1118	557	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	3.258	
1119	381	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1120	384	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	Camage Stops Abruptly
1121	384	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	No Wave Date
1122	384	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1123	384	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	200	1.629	
1124	382	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1125	385	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1126	385	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1127				LMSR/T-C Tandem	CW Zero @ steps, hinged, ramp tank, 210 deg, 10	100			
1128					Big Waves				Wrong waves sent, collected anyway
1129	379	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.147	
1130	379	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.147	
1131	376	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.147	
1132	397	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1133	397	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1134	394	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	1.629	
1135	388	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	2.45	
1136	391	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	2.45	
1137	391	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Tank on Ramp	100	210	2.45	
1138				LMSR/T-C Tandem	CW Zero @ steps, hinged, full load + ramp tank, 2	100			Changed to full load + ramp tank, and spacers provided for ramp
1139	424	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.147	
1140	427	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.147	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	Inch	
1141	427	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.147	
1142	442	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	
1143	445	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	
1144	445	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	No nano data
1145	436	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	2.45	
1146	439	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	2.45	
1147	439	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	2.45	
1148	430	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	
1149	433	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	
1150	433	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	210	1.629	
1151				LMSR/T-C Tandem	CW Zero @ steps, hinged, full load + ramp tank, 2	100			
1152	432	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1153	432	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1154	429	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1155	563	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	3.258	
1156	565	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	3.258	
1157	565	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	3.258	
1158	426	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.147	
1159	426	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.147	
1160	423	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.147	
1161	441	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1162	444	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1163	444	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.829	No Wave Data
1164	444	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	1.629	
1165	435	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	2.45	
1166	438	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	2.45	Carriage stopped early
1167	438	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	2.45	
1168	438	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	200	2.45	
1169				LMSR/T-C Tandem	CW Zero @ steps, hinged, full load + ramp tank, 1	100			
1170				LMSR/T-C Tandem	CW Zero @ steps, hinged, full load + ramp tank, 1	100			2 hour delay due to wave maker
1171	425	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.147	
1172	425	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.147	
1173	422	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.147	
1174	440	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	
1175	443	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	
1176	443	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	
1177	434	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	2.45	
1178	437	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	2.45	
1179	437	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	2.45	
1180	431	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
1181	431	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	
1182	428	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	1.629	
1183	562	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	3.258	No wave data
1184	564	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	3.258	
1185	564	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	3.258	
1186	562	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load + Tank on Ramp	100	180	3.258	Took ramp tank off after this run
1187	404	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1188	407	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1189	407	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1190	558	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	3.258	
1191	560	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	3.258	
1192	560	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	3.258	
1193				LMSR/T-C Tandem	CW Zero @ steps, hinged, full load, 180 deg, 100%	100			
1194	401	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.147	Camage stopped early
1195	401	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.147	
1196	401	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.147	
1197	398	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.147	
1198	416	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1199	419	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1200	419	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	1.629	
1201	410	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	2.45	
1202	413	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	2.45	No Wave Data
1203	413	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	2.45	
1204	413	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	2.45	Camage stopped early
1205	413	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	180	2.45	
1206	411	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	2.45	
1207	414	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	2.45	
1208	414	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	2.45	
1209	399	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.147	
1210	402	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.147	
1211	402	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.147	
1212	417	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1213	420	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1214	420	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1215	559	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	3.258	
1216	559	SS4/11.3	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	3.258	
1217	561	SS4/11.3	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	3.258	
1218	405	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1219	408	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1220	408	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	No Wave Data

Table B 1. Model Test Run Log (continued)

T_Craft Log 2010									
		SeaCond-	Speed	Vehicle	Test type	Cushion	Rel Wv Hdng	WH Target	Comments
Run	Matrix #	Omega FS	FS kts	type			180 head	inch	
1221	408	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	200	1.629	
1222	406	SS3/10	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1223	409	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1224	409	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	Carriage stopped early
1225	409	SS3/10	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1226	400	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.147	Waves looked way too big! Also, wavemaker was shut off early. Only 344 seconds of data collected
1227	400	SS3/7.5	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.147	
1228	403	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.147	
1229	403	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.147	Carriage stopped early
1230	403	SS3/7.5	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.147	
1231	418	SS3/Bi-Moda	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1232	421	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1233	421	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	Carriage stopped early
1234	421	SS3/Bi-Moda	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	1.629	
1235	412	SS4/8.8	0	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	2.45	
1236	415	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	2.45	
1237	415	SS4/8.8	4	LMSR/T-C Tandem	Hinged Stem Ramp - Full Load	100	210	2.45	

APPENDIX C

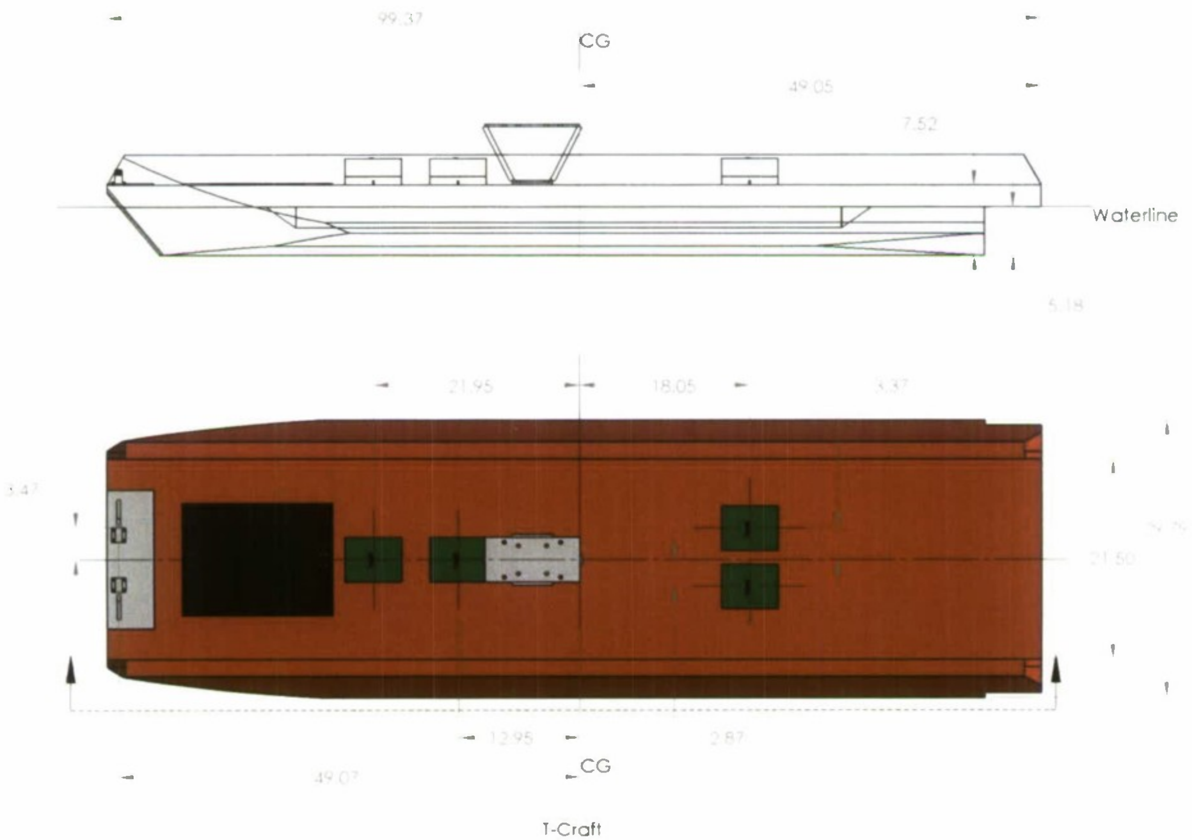

Figure C. 1 T-Craft overall dimensions and tank locations

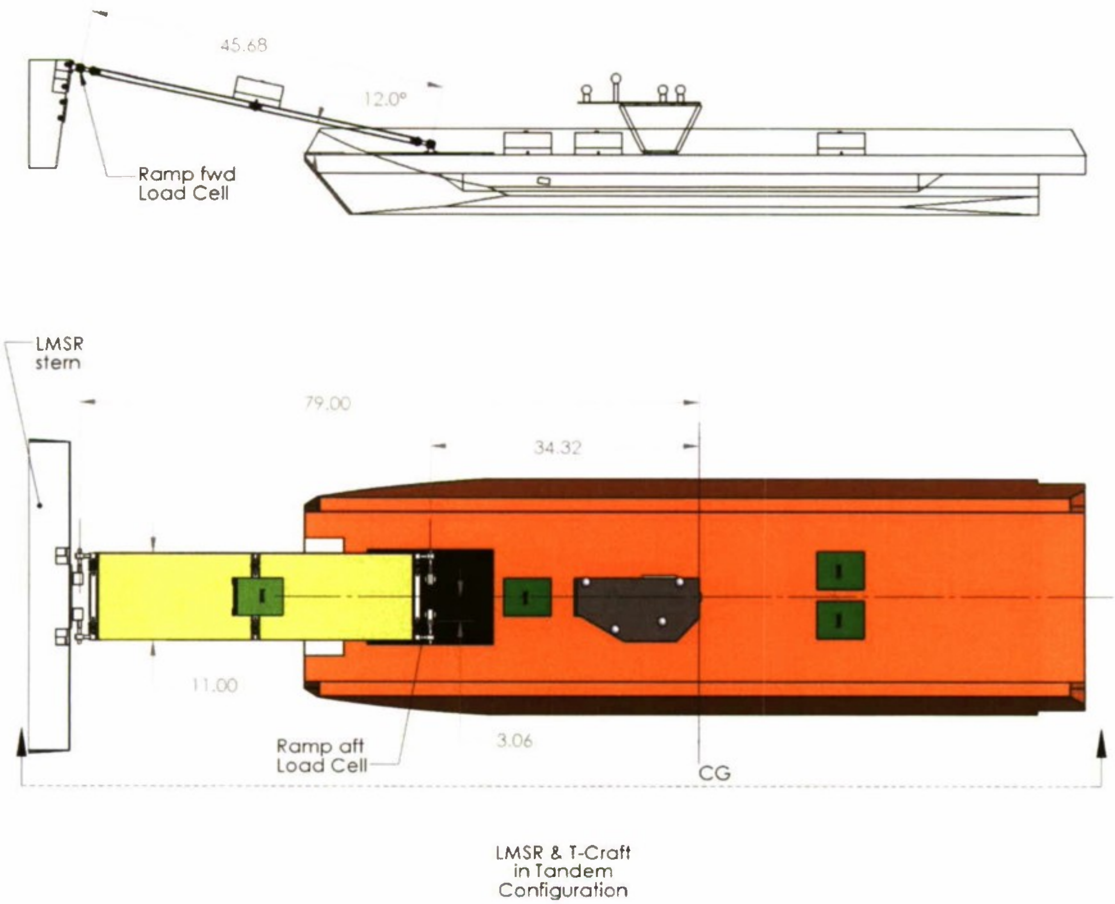

Figure C. 2 Tandem Configuration

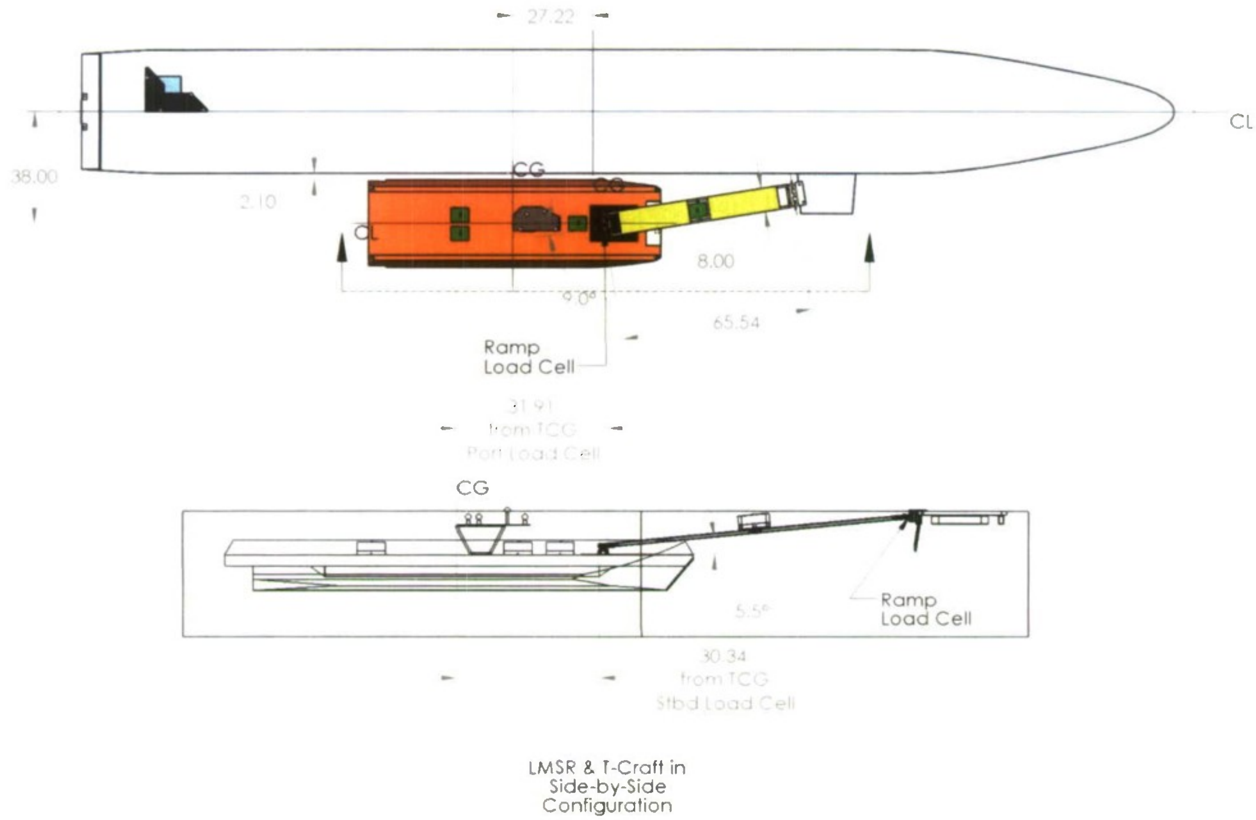

Figure C. 3. Side-by-Side configuration

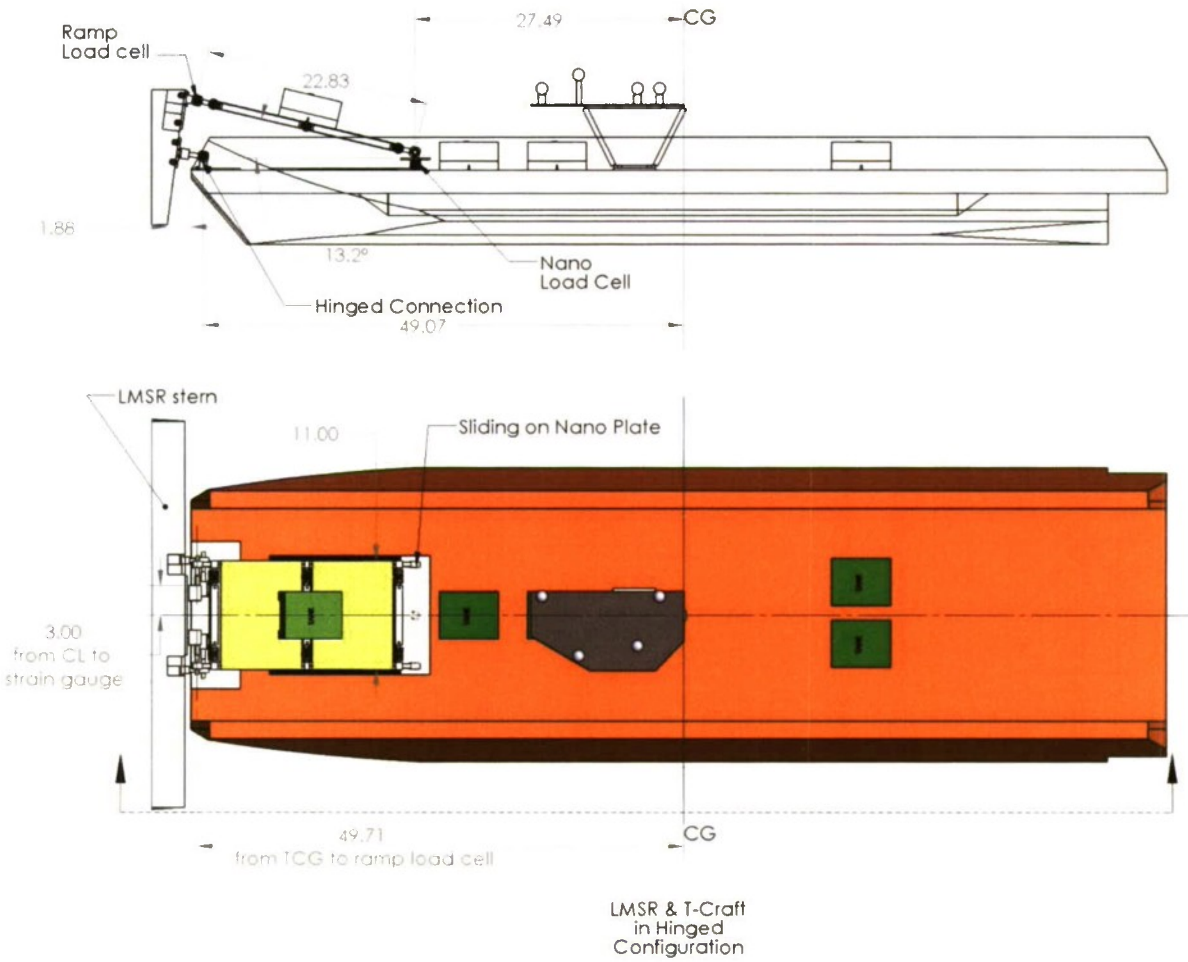

Figure C. 4. Hinge Configuration

APPENDIX D

Mean, Standard Deviation and Significant Amplitude

1. Mean, standard deviation, variance and significant amplitude

Let us consider the case where N consecutive sampled values

$$x_i \equiv x(t_i), \quad t_i \equiv (i-1)\Delta, \quad i = 1, 2, ..., N \tag{1.1}$$

are taken at uniform sampling interval Δ (in second).

The mean X (or $\bar{x}$), and the (unbiased) standard deviation σ, or the variance σ^2, are defined as

$$X = \bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{1.2}$$

$$\sigma^2 = \frac{1}{N-1}\sum_{i=1}^{N}(x_i - X)^2 = \frac{1}{N-1}\left(\sum_{i=1}^{N} x_i^{\,2} - NX^2\right). \tag{1.3}$$

We can also show that

$$\sum_{i=1}^{N} x_i^{\,2} = (N-1)\sigma^2 + NX^2. \tag{1.4}$$

The single significant amplitude is equal to 2σ and the double significant amplitude becomes 4σ. Meanwhile, the significant wave height is equal to 4σ assuming a Rayleigh distribution.

2. Segmented data

Now consider the case when the consecutive sampled values, y_i are segmented into k segments. Let's assume that there are M_1, M_2, ..., M_k sampled values of $y_i^{(1)}$, $y_i^{(2)}$, ..., $y_i^{(k)}$ in the 1st, 2nd and k th segments. The means, Y_1, Y_2, ..., Y_k, and the standard deviations, σ_1, σ_2, ..., σ_k, of the first, second, and the k th segments are

$$Y_1 = \frac{1}{M_1}\sum_{i=1}^{M_1} y_i^{(1)}, \quad \sigma_1^2 = \frac{1}{M_1 - 1}\sum_{i=1}^{M_1}(y_i^{(1)} - Y_1)^2 \tag{2.1}$$

$$Y_2 = \frac{1}{M_2}\sum_{i=1}^{M_2} y_i^{(2)}, \quad \sigma_2^2 = \frac{1}{M_2 - 1}\sum_{i=1}^{M_2}(y_i^{(2)} - Y_2)^2 \tag{2.2}$$

....

$$Y_k = \frac{1}{M_k}\sum_{i=1}^{M_k} y_i^{(k)}, \quad \sigma_k^2 = \frac{1}{M_k - 1}\sum_{i=1}^{M_k}(y_i^{(k)} - Y_k)^2 . \tag{2.3}$$

We can also show that

$$\sum_{i=1}^{M_1} \left(y_i^{(1)}\right)^2 = (M_1 - 1)\sigma_1^2 + M_1 Y_1^2 \tag{2.4}$$

$$\sum_{i=1}^{M_2} \left(y_i^{(2)}\right)^2 = (M_2 - 1)\sigma_2^2 + M_2 Y_2^2 \tag{2.5}$$

....

$$\sum_{i=1}^{M_k} \left(y_i^{(k)}\right)^2 = (M_k - 1)\sigma_k^2 + M_k Y_k^2 . \tag{2.6}$$

The mean of the whole sampled data, $\overline{Y}$, defined as

$$\overline{Y} = \frac{1}{M_1 + M_2 + ... + M_k}\left(\sum_{i=1}^{M_1} y_i^{(1)} + \sum_{i=1}^{M_2} y_i^{(2)} + ... + \sum_{i=1}^{M_k} y_i^{(k)}\right) \tag{2.7}$$

becomes

$$\overline{Y} = \frac{M_1 Y_1 + M_2 Y_2 + ... + M_k Y_k}{M_1 + M_2 + ... + M_k} . \tag{2.8}$$

The standard deviation, $\overline{\sigma}$, defined as

$$\overline{\sigma}^2 = \frac{1}{(M_1 + M_2 + ... + M_k - 1)}\left\{\sum_{i=1}^{M_1}\left(y_i^{(1)} - \overline{Y}\right)^2 + \sum_{i=1}^{M_2}\left(y_i^{(2)} - \overline{Y}\right)^2 + ... + \sum_{i=1}^{M_k}\left(y_i^{(k)} - \overline{Y}\right)^2\right\} \tag{2.9}$$

becomes

$$\overline{\sigma}^2 = \frac{1}{(M_1 + M_2 + \ldots + M_k - 1)} \begin{bmatrix} (M_1 - 1)\sigma_1^2 + M_1(\overline{Y}^2 + Y_1^2 - 2\overline{Y}Y_1) + \\ (M_2 - 1)\sigma_2^2 + M_2(\overline{Y}^2 + Y_2^2 - 2\overline{Y}Y_2) + \\ \ldots + \\ (M_k - 1)\sigma_k^2 + M_k(\overline{Y}^2 + Y_k^2 - 2\overline{Y}Y_k) \end{bmatrix}. \quad (2.10)$$

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